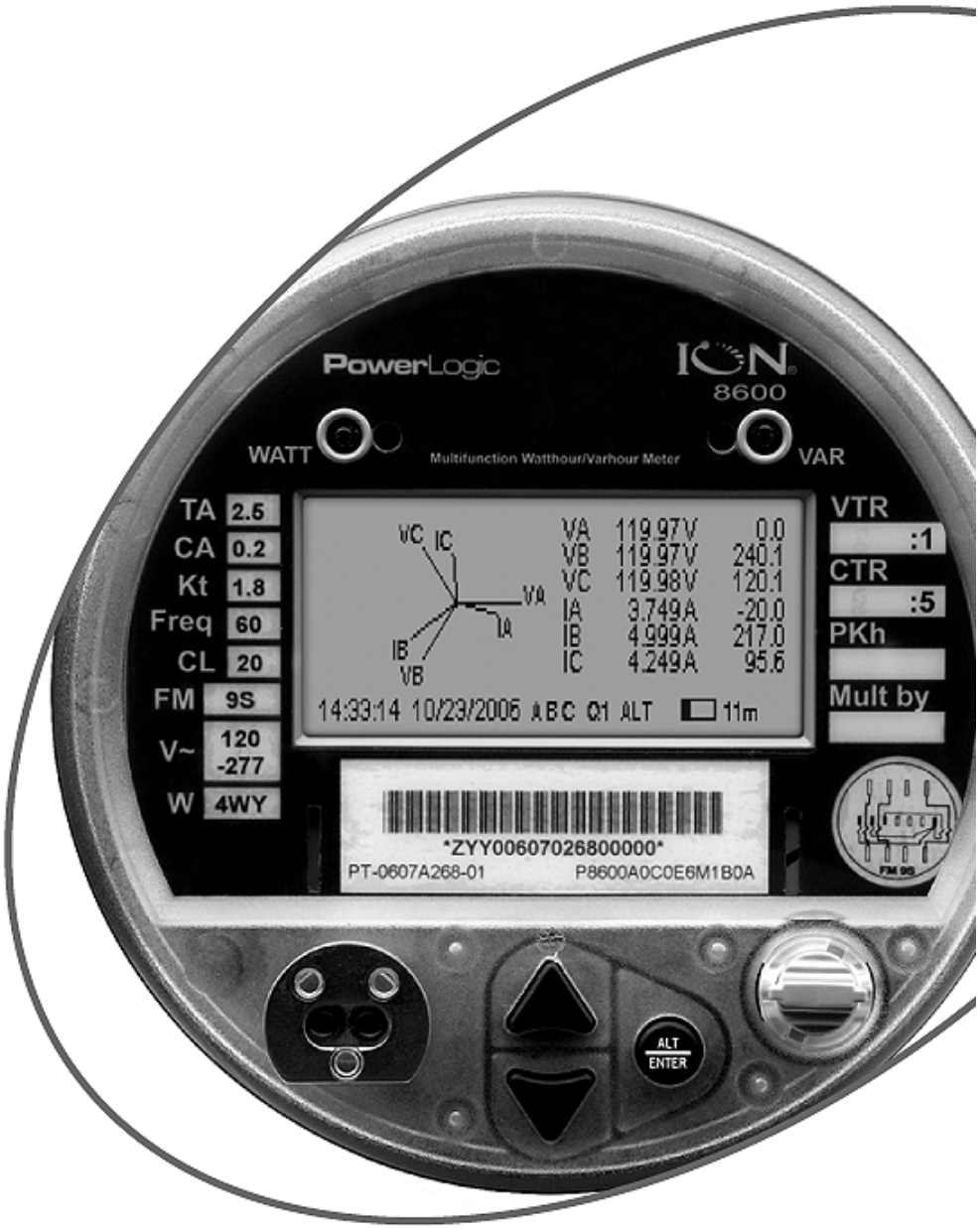
PowerLogic® ION8600

Metering & Control Device

User Guide
May 2007



Schneider Electric

Notices

Danger

This symbol indicates the presence of dangerous voltage within and outside the product enclosure that may constitute a risk of electric shock, serious injury or death to persons if proper precautions are not followed.

Caution

This symbol alerts the user to the presence of hazards that may cause minor or moderate injury to persons, damage to property or damage to the device itself, if proper precautions are not followed.

Note

This symbol directs the user's attention to important installation, operating and maintenance instructions.

Installation Considerations

Installation and maintenance of the ION8600 meter should only be performed by qualified, competent personnel that have appropriate training and experience with high voltage and current devices. The meter must be installed in accordance with all local and national electrical codes.

⚠ DANGER

Failure to observe the following instructions may result in severe injury or death.

- During normal operation of the ION8600 meter, hazardous voltages are present on its blades, and throughout the connected potential transformer (PT), current transformer (CT), digital (status) input, control power and external I/O circuits. PT and CT secondary circuits are capable of generating lethal voltages and currents with their primary circuit energized. Follow standard safety precautions while performing any installation or service work (i.e. removing PT fuses, shorting CT secondaries, etc.).
- The blades on the meter base should not be user-accessible after installation.
- Do not use digital output devices for primary protection functions. These include applications where the devices perform energy limiting functions or provide protection of people from injury. Do not use the ION8600 in situations where failure of the devices can cause injury or death, or cause sufficient energy to be released that can start a fire. The meter can be used for secondary protection functions.
- Do not HIPOT/Dielectric test the digital (status) inputs, digital outputs, or communications terminals. Refer to the label on the ION8600 meter for the maximum voltage level the device can withstand.

⚠ CAUTION

Observe the following instructions, or permanent damage to the meter may occur.

- The ION8600 meter offers a range of hardware options that affect input ratings. The ION8600 meter's serial number label lists all equipped options. Applying current levels incompatible with the current inputs will permanently damage the meter.
- The ION8600 meter's chassis ground must be properly connected to the switchgear earth ground for the noise and surge protection circuitry to function correctly. Failure to do so will void the warranty.
- Terminal screw torque: Barrier-type (current, voltage, and relay terminal screws: 1.35 Nm (1.00 ft-lbf) max. Captured-wire type (digital inputs/outputs, communications, power supply: 0.90 Nm (0.66 ft.lbf) max.

FCC Notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. The Ringer Equivalence Number (REN) for the ION8600 optional internal modem is 0.6. Connection to the ION8600 internal modem should be made via an FCC Part 68 compliant telephone cord (not supplied). The ION8600 cannot be used on a public coin phone service or party line services.

Network Compatibility Notice for the Internal Modem

The internal modem in meters equipped with this option is compatible with the telephone systems of most countries in the world. Use in some countries may require modification of the internal modem's initialization strings. If problems using the modem on your phone system occur, please contact Schneider Electric Technical Support

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Covered by one or more of the following patents:

U.S. Patent No's 7010438, 7006934, 6990395, 6988182, 6988025, 6983211, 6961641, 6957158, 6944555, 6871150, 6853978, 6825776, 6813571, 6798191, 6798190, 6792364, 6792337, 6751562, 6745138, 6737855, 6694270, 6687627, 6671654, 6671635, 6615147, 6611922, 6611773, 6563697, 6493644, 6397155, 6236949, 6186842, 6185508, 6000034, 5995911, 5828576, 5736847, 5650936, D505087, D459259, D458863, D443541, D439535, D435471, D432934, D429655, D427533.

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Chapter 1

Introduction

PowerLogic ION8600 meters provide revenue-accurate, true RMS measurements of voltage, current, power and energy, and are complemented by extensive I/O capabilities, comprehensive logging, and advanced power quality measurement and compliance verification functions. The meters come with an extensive selection of pre-configured data screens and measurements, so you can use the meters "out of the box" or customize them to fit your unique requirements.

ION8600 meters give you the tools to manage complex energy supply contracts that include commitments to power quality. You can also integrate the meters with ION® software or other energy management, SCADA, automation and billing systems, via Internet communications and multiple industry-standard communication channels and protocols including MV90.

In this chapter

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ION8600 Meters

ION8600 meters are suited to a wide range of applications. The meters can be used as stand-alone devices, but their extensive capabilities are fully realized when used as part of an enterprise energy management (EEM) system. The ION8600 is available in the following feature sets:

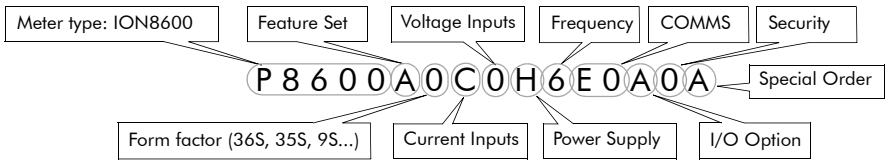
Model	Feature Set
ION8600A	10MB memory, 50 data recorders (800 channels), waveform recorders and transient detection
ION8600B	4MB memory, 20 data recorders (320 channels), Modbus Mastering
ION8600C	2MB memory, 2 data recorders (32 channels), sag/swell detection

NOTE

For complete details of the ION8600 meter feature sets, see the ION8600 Datasheet available for download from the PowerLogic website.

ION8600 Naming Convention

In the serial number and ANSI bar code area of the meter's front panel you can view the feature set, form factor and as well as any special order options available with the meter.



When there are differences between the models (such as a feature specific to one model), it is indicated with the appropriate model number.

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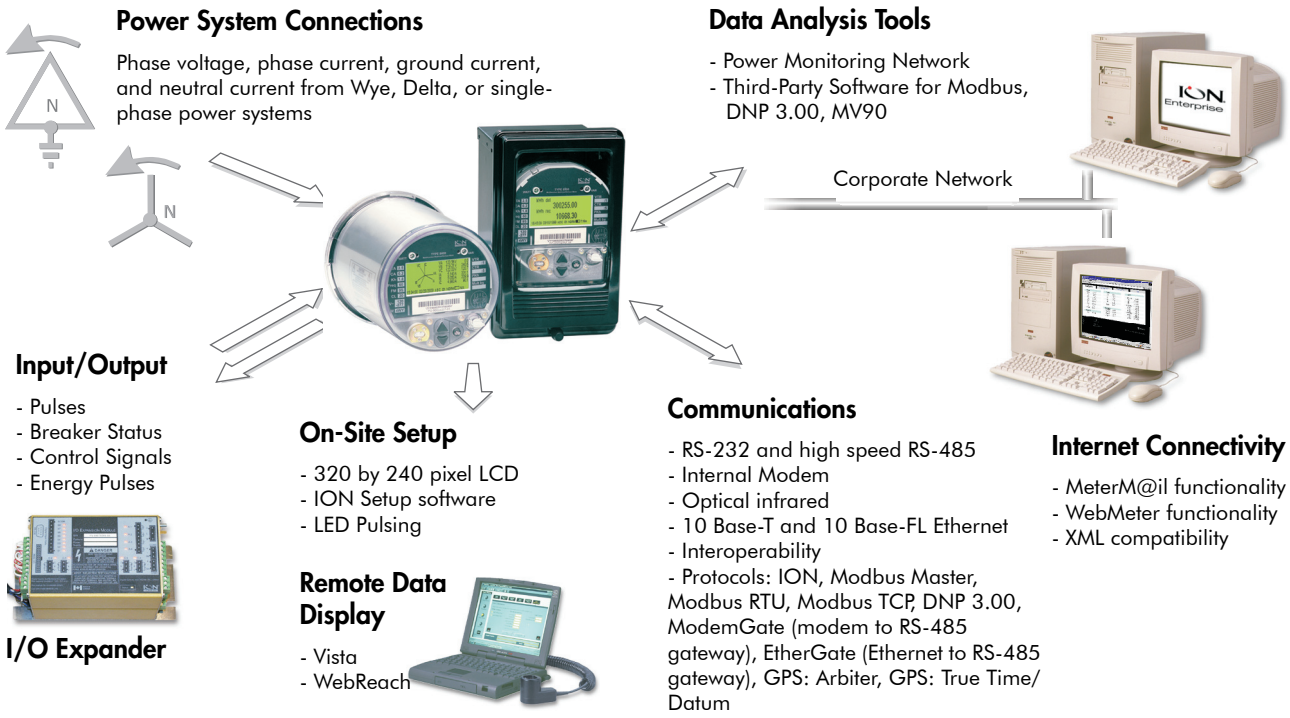
ION8600 in Enterprise Energy Management Systems

Applications that include the meter typically require additional equipment. Display and analysis software tools are almost always used to manage, interpret and distribute the data measured or logged by a meter. There are usually a variety of tools used, and often these tools are connected using different communications standards and protocols. In many cases, a meter must also provide control capabilities and device-level data sharing.

The meter can adapt to many situations. Advanced communications allow data to be shared simultaneously across multiple networks, built-in I/O provides monitoring and control capabilities, and a variety of display and analysis tools can be used to monitor your power system.


Power System Connections
Phase voltage, phase current, ground current, and neutral current from Wye, Delta, or single-phase power systems
N
N
Data Analysis Tools
- Power Monitoring Network
- Third-Party Software for Modbus, DNP 3.00, MV90
ION Enterprise
Corporate Network
Input/Output
- Pulses
- Breaker Status
- Control Signals
- Energy Pulses
I/O Expander
On-Site Setup
- 320 by 240 pixel LCD
- ION Setup software
- LED Pulsing
Remote Data Display
- Vista
- WebReach
Communications
- RS-232 and high speed RS-485
- Internal Modem
- Optical infrared
- 10 Base-T and 10 Base-FL Ethernet
- Interoperability
- Protocols: ION, Modbus Master, Modbus RTU, Modbus TCP, DNP 3.00, ModemGate (modem to RS-485 gateway), EtherGate (Ethernet to RS-485 gateway), GPS: Arbiter, GPS: True Time/ Datum
Internet Connectivity
- MeterM@il functionality
- WebMeter functionality
- XML compatibility

Data Display and Analysis Tools

Not only does the meter's front panel allow meter configuration and data display, but the meter also integrates seamlessly with display and analysis software available from Schneider Electric. ION Enterprise software is the network and device configuration software that also lets you analyze and monitor your system and produce reports for any department in an organization. Furthermore, you can use data acquired by the meter in a variety of third-party systems. ION software is designed to make use of all the available advanced capabilities.

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The Front Panel

Local monitoring and standalone applications are facilitated by the meter's front panel interface. The front panel combines real-time display features with limited device configuration functions. The front panel is often used in combination with an ION software system, providing an interface for field personnel.

WebMeter® Internal Web Server Feature

An on-board Web server combined with an Ethernet port provides quick and easy access to real-time energy and basic power quality information without special software: this is WebMeter functionality. The built-in web pages display a range of energy and basic power quality information through the web-enabled device; these pages even support basic meter configuration tasks.

MeterM@il® Internal Email Server Feature

Configure the meter to automatically email high-priority alarm notifications or scheduled system-status update messages to anyone, anywhere within the facility or around the world. Specify the type of event that triggers an email alert, such as power quality disturbances or logged data at any pre-determined interval, and have your ION software administrator program the meter to respond with a MeterM@il message when these events occur. MeterM@il messages can be received like any email message over a workstation, cell phone, pager, or PDA.

XML Compatibility

The meters can exchange information using industry-standard XML format. This simple machine-readable format supports easy integration with custom reporting, spreadsheet, database, and other applications.

ION Enterprise® Software

The complete ION Enterprise software package enables the meter to be part of a fully networked information system with other meters and local and wide-area computer networks. ION Enterprise is recommended for all power monitoring systems where advanced analysis and control capabilities are required.

ION Enterprise provides tools for managing your power monitoring network, logging data, analyzing real-time and logged data, generating power system reports, and creating custom functionality at the meter level.

ION Enterprise also offers two ways to remotely view information through a web browser: the WebReach component of ION Enterprise, and Microsoft Terminal Services.

- WebReach only requires an URL to display a meter's real-time data and select views of historical and waveform data from a web browser; there is no client machine configuration. WebReach is a data display application; there is no control functionality available through it.
- Microsoft Terminal Services enable full ION Enterprise functionality, including control features. Some client machine configuration is required.

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ION Setup Software

ION Setup is a meter configuration tool designed specifically to configure and test meters. ION Setup offers an intuitive graphical interface for performing basic meter setup, installing templates into meters, viewing real-time and reset accumulated values, verifying meter calibration and measurements, and setting up advanced security.

MV90

MV90 software (by Utility Translation Systems) is a multi-vendor translation system that can collect and analyze data from a variety of different brands of meters. One of the unique features of MV90 is its ability to log some information coming from several different brands of meters, each with unique database formats. MV90 manipulates this data without extensive knowledge of the device of origin. This is done by using TIM modules; each TIM module acts as a protocol translator specific to a device type, and it will convert some pre-defined data from a meter to the MV90 database format. The TIM module used for ION meters is called TIM_ION.

Communications Methods

The meter can be integrated into various industry-standard networks. Data that is measured by the meter can be made available to other devices using the Modbus Master, Modbus RTU, Modbus TCP, and DNP 3.00 protocols, as well the MV90 translation system. You can also configure the meter to import data from devices on these networks. With these advanced communications functions, the meter operates in most existing power monitoring systems. Any data display and analysis software that works with Modbus RTU or DNP 3.00 devices will also function with the meter.

The standard meter includes a selectable RS-232/RS-485 port (the factory default is RS-232), a high-speed RS-485 port, and an IrDA optical port for communications in the field. Order options include a 10Base-T Ethernet port or 10Base-FL fiber-optic port, and a 57.6 kbps internal modem (both FCC and CTR-21 compliant). Depending on the hardware options purchased, up to four separate ports can communicate simultaneously.

Digital and Analog I/O Options

The meter has digital inputs and outputs for a variety of applications. Additionally, a LED on the front panel is configured for energy pulsing. An optional I/O Expander product option is also available for digital and analog communication. There is separate I/O Expander documentation that accompanies this option.

Onboard I/O

The meter contains four Form C digital outputs and three Form A digital inputs. They can be used for monitoring breaker trips or send KYZ pulsing information to third-party system equipment.

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Expanded I/O

The I/O Expander option extends the meter's I/O capabilities. The digital I/O Expander model provides four Form A digital outputs, four Form C digital outputs, and eight Form A digital inputs. The analog I/O Expander model replaces the four form A digital outputs with analog outputs.

The Meter is Factory-Configured and Ready to Operate

Even though the meter is fully customizable, it is shipped from the factory with many pre-configured functions. Once you have performed the installation and basic setup, all of the basic measurements, energy calculations and recording functions are ready to operate right out of the box. You may find that the factory configuration aptly serves your purposes, allowing you to forego additional configuration.

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Using this Guide

This User's Guide is directed at three types of user: the typical user or operator, the system administrator, and the advanced user. You might not fit into any of these groups directly, or perhaps you are both an operator and an administrator. These classifications are intended to make this guide easier to navigate with respect to which information is appropriate to your needs.

Typical User or Operator

Most users simply want to display the data provided by the factory-configured meter. These users want fast access to data through the front panel, ION software, or a third-party protocol such as Modbus or DNP.

System Administrator or Manager

Some users need to make minor adjustments so that their meters "fit" their power systems: data recording intervals, demand sub-intervals and other parameters may need to be set before the meter's setup is complete. These users will use the front panel, or ION software to change settings in the device's operating software. (ION Enterprise is highly recommended.)

Advanced User or Systems Integrator

Advanced users may want to make use of the flexibility and power provided by the device's operating software. These users will need to become familiar with the ION architecture, and the ION software tools used to customize the device's operation.

Symbols

The following symbols are used in this manual to warn you about the risk of injury, damage to the equipment, inconvenience if the proper procedure is not followed, or additional information you may want to consider.

⚠ CAUTION

This symbol alerts you to things that may cause loss of data, damage to your computer or your device.

⚠ DANGER

This symbol alerts you to things that may cause serious injury to a person. Only qualified, properly trained personnel should perform these procedures.

NOTE

A note provides you with additional information that you might want to consider.

TIP

This symbol draws your attention to information that will help you perform a task more quickly or easily.

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Terminology

Clear:	Place the mouse cursor over the check box for the specified option, then click the mouse button so that the check mark is removed from the check box.
Click:	Place the mouse cursor over the specified option or button, then press and release the mouse button.
Double-click:	Place the mouse cursor over the specified option or button, then press and release the mouse button twice.
Drag:	Hold down the mouse button while moving the mouse cursor to the appropriate location, then release the button.
Enter:	Type the information, then press the ENTER or RETURN key.
Point:	Position the mouse pointer over a submenu or menu command. For example, point to the File menu.
Press:	Press the specified key or key combination on your keyboard, for example, press CTRL+ALT+DEL.
Select:	Place the mouse pointer over the check box for the specified option, then click the mouse button so that an X or check mark appears in the check box. Or: Place the mouse pointer over the specified box or button, then click the mouse button.
Type:	Type the information. Do not press the Enter or Return key.

PDF Documents

This manual is also provided in PDF (Portable Document Format) from the PowerLogic website.

Use Acrobat Reader to view and print the PDF version of the manual. When printing the manual, please print the entire manual, including the copyright and disclaimer statements.

The PDF files for all Schneider Electric products are also available from the website. Each Schneider Electric device has installation information and a user's guide to teach you about the features of your device.

ION meters are programmed using ION modules that are linked to create unlimited custom functionality. Your meter has many pre-configured modules that provide most functionality that you need. If you want to extend or customize the functionality of your meter consult the online *ION Reference* for general information and ION module descriptions. For information on configuring features search the technical notes.

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Getting More Information

Additional information is available from Schneider Electric. Check our website at www.powerlogic.com, contact your local Schneider Electric representative, or contact Schneider Electric directly (contact information is provided on the first page of this document). Documents that are related to the installation, operation and application of the meter are as follows:

Installation Guide

This brief guide is shipped with each meter. It details the mounting, wiring and basic setup of the device.

Online ION Setup Help

This online reference has in-depth information on installation, setup and security of ION Setup. It also contains detailed descriptions of ION meter configurations using the Setup Assistant.

ION Reference

This online reference contains detailed descriptions of all modules in an ION meter.

ION Enterprise Getting Started Guide

This guide explains the installation and configuration of the ION Enterprise software suite.

Online ION Enterprise Help

Each ION Enterprise software component has an in-depth online help system.

Technical Notes

Technical notes are available from our website. These documents are regularly updated with new and revised content and features.

Application Notes

Online application notes offer detailed, high-level descriptions of real-world situations, where Schneider Electric's ION devices and ION software provide beneficial solutions.

Before You Can Use this Guide

By the time you are ready to use this guide, your meter should be installed, basic setup should have been performed, and communications/basic operation should have been verified. If the unit is not yet installed and operational, refer to the *Installation Guide* that shipped with the meter.

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Chapter
2

Front Panel

The front panel of the ION8600 provides a user-friendly interface from which you can view system data or configure meter settings. A scrollable display and three distinct modes (NORM, ALT and TEST) provide easy access to a full range of functions through a simple three-button keypad.

This chapter describes the front panel and explains how to use it to display data, perform tests, and set up basic configuration options.

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  - TEST mode button 23
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- **Modes of Operation** **27**
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  - ALT mode 27
  - TEST mode 28
- **Configuring the Meter with the Front Panel** **29**
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  - Returning to Previous Setup Screens 31
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  - COM Ports Setup Menu 33
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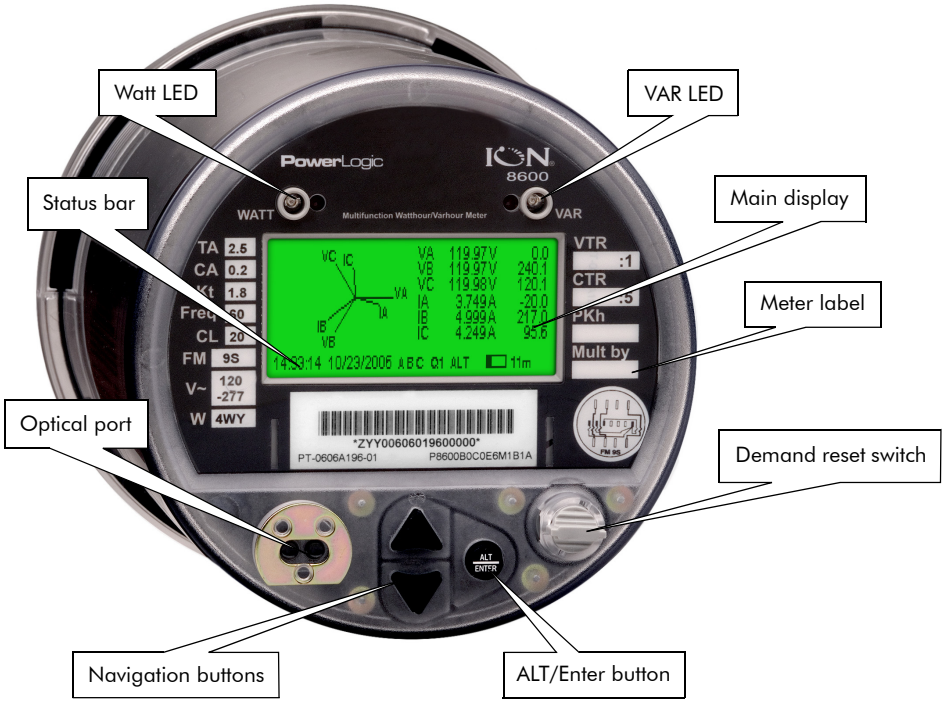
Front Panel Features

The front panel of the ION8600 includes a liquid crystal display with detailed graphics and text, Up and Down arrow buttons to aid in screen navigation and basic setup procedures, as well LED pulsers to aid in testing the meter. This section outlines the features available on the front panel of the meter.



The meter's display can show numeric data screens, event logs, phasor diagrams, bar graphs and harmonics histograms. As the graphic above illustrates, the display screen is divided into two sections: the main display area and the status bar.

The main display area presents meter data and status information; the status bar provides time, date, phase, quadrant, and mode information. During normal operation, the main display area automatically cycles through a series of several displays. If you prefer, you can use the Up or Down arrow buttons to step manually through these displays. By default, the automatic scrolling will resume 60 seconds after you have pressed a button.

TIP

To adjust the contrast, hold down the **Up** and **Down** arrow buttons simultaneously. When the contrast reaches the desired level, release the buttons.

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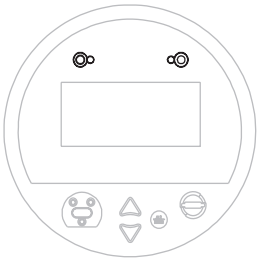
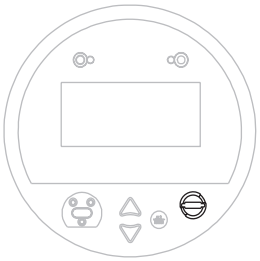


LED pulsers

Two LED pulsers located near the top of the front panel represent WATT - to the left - and VAR - to the right.

These LEDs are pre-configured for energy pulsing. The adjacent smaller infrared outputs are connected to the LEDs and pulse at the same rate. Pulse rates can be adjusted by re-configuring the Calibration Pulser module; for a detailed description of LED pulsers operation, refer to “Energy Pulsing with LEDs” on page 139).

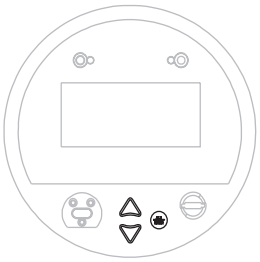


Demand reset switch

Located on the front of the meter's external cover assembly, the Demand Reset switch resets the peak demand values logged in the meter. This switch can be activated with the cover on or off. When the meter is in TEST mode, the Demand Reset switch resets the test demand parameters.

In most applications, the Demand Reset switch is sealed with an anti-tamper mechanism; a through-hole in the switch can accommodate either an external seal or a locking mechanism. See “Anti-Tamper Sealing Methods” on page 71 for a discussion of Anti-Tamper sealing.

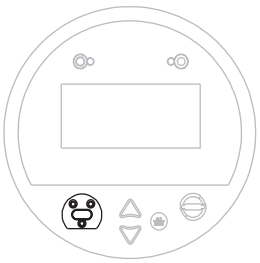
The ION setup register labeled Demand Lockout Time sets the minimum time allowed between consecutive demand resets; the meter ignores any attempts to reset the demand outside the bounds of the register. The default value for the Demand Lockout time is 25 days. For details on the Demand Lockout Time setup register, refer to “Demand and Peak Demand Module Overview” on page 121.



Navigation buttons

The navigation buttons are the Up and Down arrow buttons and the round Alt/Enter button. Pressing the Up or Down arrow buttons to manually scroll back or forth through the available displays temporarily halts the display screen’s automatic scrolling function. Pressing Alt/Enter toggles between NORM and ALT display modes. The automatic scrolling function restarts 60 seconds after a button was last pressed.

Hold the **Alt/Enter** button for approximately three seconds to display the Setup menu. You can then use the navigation buttons to view the device's configuration or edit communication settings. See “Setup Menus” on page 32 for further instruction on modifying the device's configuration using the front panel buttons.



Optical port

An optical port facilitates infrared communication with the device. For details on how to configure and use this port, see “Configuring the Optical Port” on page 82.

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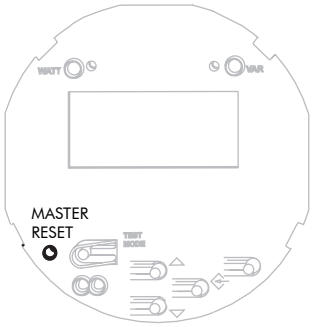

Master Reset button

You must remove the meter cover as well as its label to access the Master Reset button; it is a pin-hole located in the lower left of the faceplate (it is labeled "Energy Reset" on some meters). This button is recessed to prevent accidental activation. For instructions on removing the meter cover, see "Performing a Master Reset from the front panel" on page 186.

Use the Master Reset button to delete most accumulated values and all derived revenue measurements from the meter.

To use the Master Reset button:

1. Remove the outer cover assembly.
2. Using a pencil or similar instrument, press and hold the **Master Reset** button until the "Master Reset in Progress" message is displayed on the front panel.

⚠ CAUTION

After initiating a Master Reset, wait until the "Master Reset Completed" message appears on the front panel (or about two minutes, depending on your firmware). This allows the meter to completely reset parameters. This is especially important if you are powering down the meter after a Master Reset.

Hardware-Locked Meters and Master Reset

Master reset is not accessible via software in a hardware-locked meter, whether the meter is in TEST, ALT or NORM mode. To perform a master reset on a hardware-locked meter, you must remove the front cover and press the master reset button.

With a meter that is not hardware-locked, you can perform a Master Reset via software. It does not have to be in TEST mode.

Parameters affected by a Master Reset

The Master Reset button resets many of the device's measurements and logs. The mode that the meter is in (NORM mode or TEST mode - see "Modes of Operation" on page 27) defines the values that will be reset.

NORM or ALT mode

In NORM or ALT mode, the following parameters are reset to zero:

- Energy and Demand
- Peak Demand
- Loss Calculation
- Power Quality disturbance counters
- Time of Use

The following are cleared:

- Event Log
- All Data Recorders
- All Waveform Recorders

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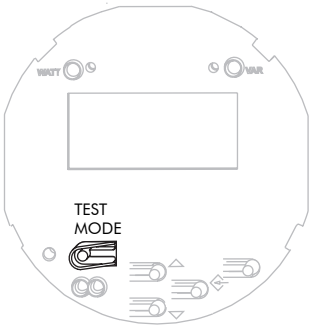
TEST mode

All TEST mode Energy and Demand measurements are set to zero.



TEST mode button

The TEST mode button is located under the meter's external cover assembly; it places the meter into TEST mode. While in TEST mode, the meter ceases accumulation of billable quantities; energy and demand measurements are accumulated in TEST mode registers.

Refer to “TEST mode” on page 28 for more details on this mode of operation.

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Display Screen Types

The front panel displays measurements, configured settings and configuration data in a variety of forms. The types of display screens are described below. For information on customizing the display on your meter, see "Configuring Front Panel Displays" on page 167.

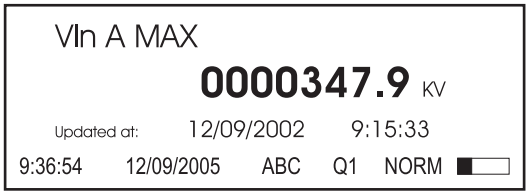
The status bar

The status bar runs along the bottom of the front panel display and contains information about the following settings:

- Date and time (in 24 hour format).
- Voltage phases present. The labels and rotation of phases correspond to the configuration of the power monitoring system. AB BC is for Delta configuration (35S forms), ABC is four wire Wye configurations (9S/36S forms).
- Quadrant where the system power factor resides.
- Mode (NORM, ALT or TEST).
- Time remaining in the Rolling Block Demand interval. If the interval has counted to zero the letters **EOI** (End Of Interval) appear on the status bar. If the interval is counting down then a time remaining indicator appears.

Numeric displays

All NORM mode data and some of the ALT mode display screens use numeric displays. Numeric displays show up to four parameters at a time. If no numeric values are available for a parameter, N/A is displayed.



The front panel automatically scales the units for basic measurements (i.e. voltage, current and power parameters). For example, a measurement of 2,000 Watts is displayed as 2 kW. A measurement of 2,000,000 Watts is displayed as 2 MW. The meter makes these conversions using your PT and CT Ratios.

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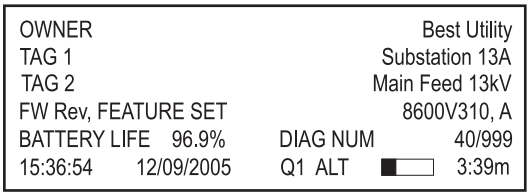
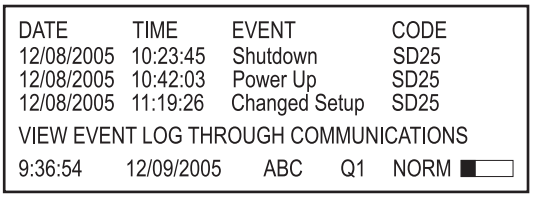
The meter only performs these automatic units if the measurement is derived solely from the Power Meter module's output.

Nameplate display and event log

Nameplate displays and event logs appear in ALT mode and are organized in tabular format. Nameplate displays show owner, meter and power system details:

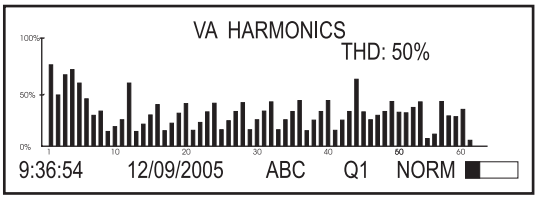

OWNER Best Utility
TAG 1 Substation 13A
TAG 2 Main Feed 13kV
FW Rev, FEATURE SET 8600V310, A
BATTERY LIFE 96.9% DIAG NUM 40/999
15:36:54 12/09/2005 Q1 ALT 3:39m

The Event Log displays recent high priority events. You must use ION software to retrieve all logged data:


DATE TIME EVENT CODE
12/08/2005 10:23:45 Shutdown SD25
12/08/2005 10:42:03 Power Up SD25
12/08/2005 11:19:26 Changed Setup SD25
VIEW EVENT LOG THROUGH COMMUNICATIONS
9:36:54 12/09/2005 ABC Q1 NORM

Histogram displays

Harmonic content is displayed in histogram format. The 2nd to the 63rd harmonics (31st on the ION8600C meter) are displayed in the histogram. The total harmonic distortion (THD) is displayed above the histogram.



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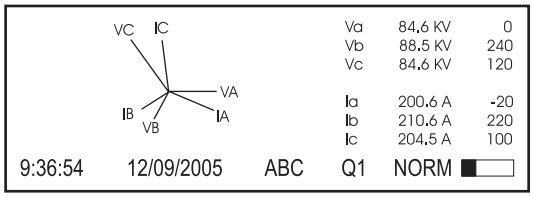
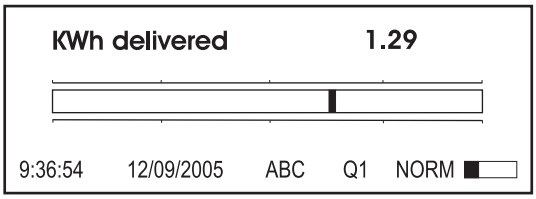
Phasor diagram displays

Phase information can be displayed in phasor diagram format. Phasor diagrams are accompanied by tables that show phase, voltage and current magnitudes. In cases where a phase vector is too small to be represented graphically, it is shown as a table entry only.



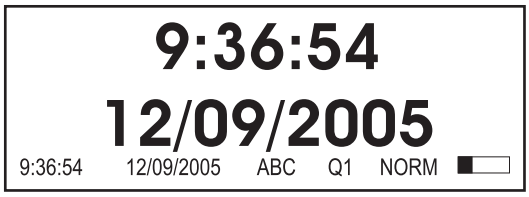
Disk simulator

This display simulates the behavior of a mechanical watt-hour meter indicating power received or delivered by the direction of the pulse.



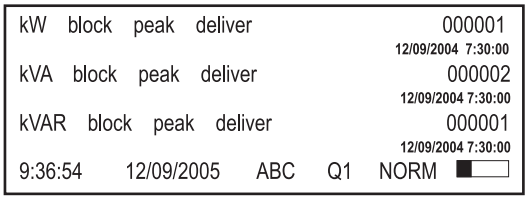
Time and date

This displays supports time and date formats, enabling displays with nothing but date and/or time and/or time remaining in the current interval.



Time-stamped values

Up to three timestamped parameters can display on the same screen. The timestamp indicates the time that the displayed parameter was last updated.



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Modes of Operation

The ION8600 has three modes of operation: NORM, ALT and TEST. Both NORM and ALT are display modes, providing various power system data and meter properties screens. TEST mode is used to perform diagnostics and verify the meter's calibration and function.

NOTE

If your meter has the optional hardware lock, you must remove the meter's cover to put it into TEST mode. Refer to "Meter Security Features" on page 52 for more information.

Basic operation (NORM mode)

The meter defaults to NORM mode when powered up, and remains in this mode until you manually switch to ALT or TEST.

NOTE

You can customize NORM mode display screens and alter the front panel's scrolling characteristics by editing the configuration of the meter's Display and Scroll modules – refer to "Display Setup Menu" on page 37 for more details.

If you have a meter *without* the hardware lock, all of the settings available in the panel Setup menu can be changed while the meter is in NORM mode, provided you have the correct password. If you have a hardware-locked meter, only the basic communications parameters in the COM Setup menu can be changed in NORM mode. (You must enter TEST mode to change other meter parameters on the hardware-locked meter — refer to "Additional Revenue Metering Security" on page 70 for more details.)

ALT mode

ALT mode provides scrolling display screens that show power system data, billing information (including extensive Time of Use data) and meter properties such as Nameplate information.

ALT mode screens are described in "ALT mode default display screens" on page 172.

Switching to ALT mode

Press the **Alt/Enter** button to switch to ALT mode. Press the **Alt/Enter** button again to switch back to NORM mode at any time. If no buttons are pressed, the meter automatically reverts to NORM mode after five minutes. As with any mode, pressing any button temporarily suspends display screen scrolling, allowing you to press the Up or Down arrow buttons to manually browse the available screens.

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TEST mode

TEST mode is typically used for verifying meter calibration and function. The meter is usually reading data from a test power supply while these functions are performed.

All of the billing quantities that are recorded when the meter is in NORM and ALT mode will stop accumulating when the meter is switched to TEST mode — the data is sent to special TEST mode registers instead. The values accumulated in these test registers are displayed on the front panel (and in Vista software).

The regular NORM/ALT mode billing registers are unaffected while the meter is in TEST mode; accumulation of this data continues as soon as you exit TEST mode. All test registers are reset to zero when you exit TEST mode.

For detailed information on TEST mode, see “Switching to TEST Mode” on page 179.

NOTE

The meter will always return to NORM mode when you exit TEST mode, even if you entered TEST mode from ALT mode.

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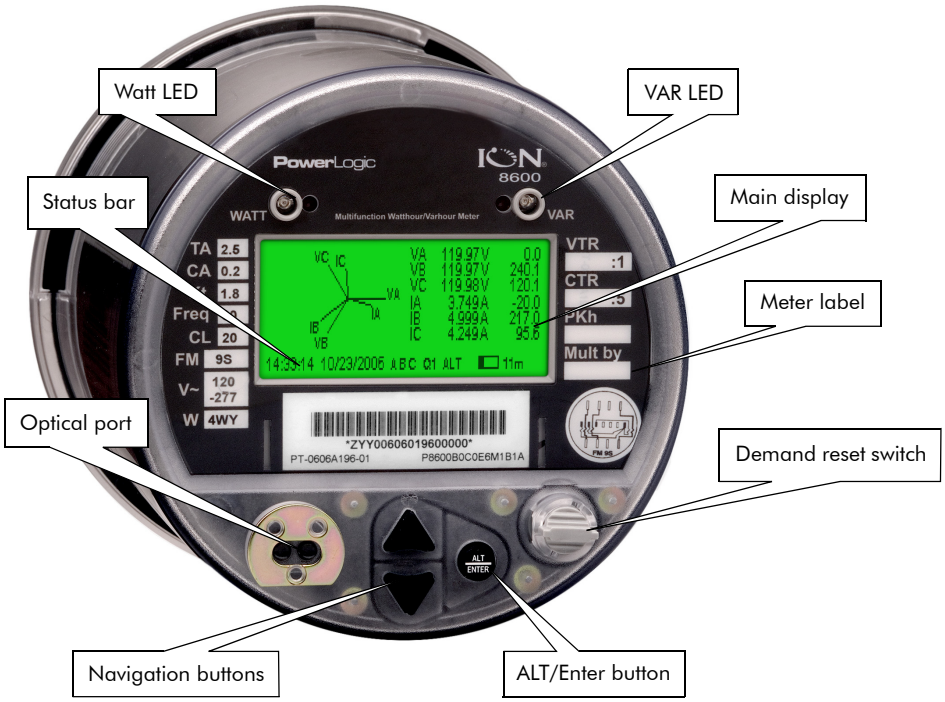
Configuring the Meter with the Front Panel

With the meter's front panel, you can navigate through different menus to perform basic setup on your meter.



Accessing the Setup Menu

To access the Setup menu, press and hold the front panel's **Alt/Enter** button while the meter is displaying power system data. Within the Setup menu is a list of sub-menus that contain the meter's configurable settings. Setup menu items are described in "Front Panel Features" on page 20.

Press the **Up** or **Down** arrow buttons to navigate through the menu. Highlight a menu item and press the **Alt/Enter** button. When you select an item from the Setup menu, you will be presented with another menu of the settings in the meter. You may need to penetrate several layers of menus to access the setting you want to change.

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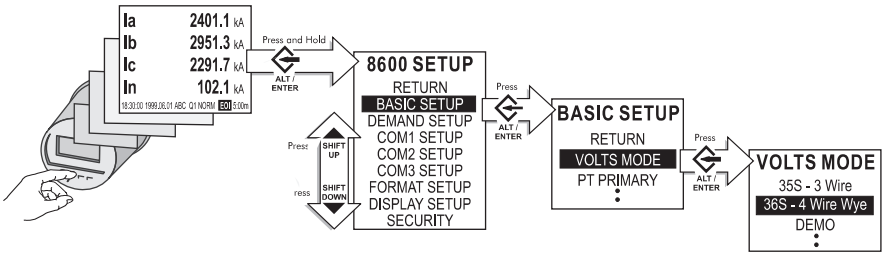
The following diagram shows how the buttons are used to navigate the menus:



The settings contained in the Setup menu are:

Basic Setup:	Changes basic settings in the power measurement system configuration.
Demand Setup:	Rolling Block/Sliding Window and Thermal Demand settings.
COM1 Setup:	RS-232/RS-485 multiplexed port setup.
COM2 Setup:	Modem setup.
COM3 Setup:	Optical port setup.
COM4 Setup:	RS-485 port setup.
Network Setup:	Ethernet/Fiber 10Base-T port setup.
Format Setup:	Customizes the style and values appearing on the display screens.
Display Setup:	Customizes display appearance, update time, and demand lockout time.
Security:	Allows you to modify or disable the password, or disable meter configuration with a web browser.

Each of these settings are discussed in turn in “Setup Menus” on page 32.

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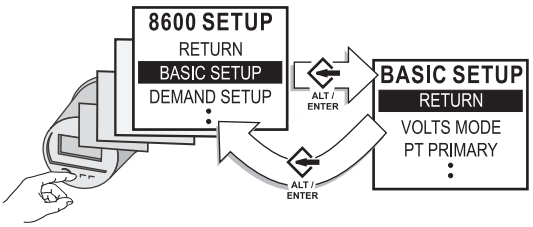
Returning to Previous Setup Screens

Use the Up or Down arrow buttons to scroll through the menu items. When the setting you want to change is highlighted, press the **Alt/Enter** button.

To return to a previous screen, highlight the RETURN menu item and then press the **Alt/Enter** button.



Configuring Parameters Using the Navigation Buttons

Use the Up or Down arrow buttons to change the value (if numeric) or the setting (if enumerated) of the highlighted parameter.

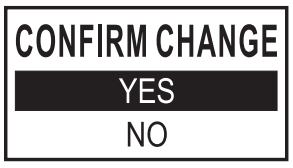
To change the position of the cursor, press the **Up** or **Down** arrow buttons for about one second. The Up arrow button moves the cursor one position to the left, and the Down arrow button moves the cursor one position to the right. Once you have the value you want, press the **Alt/Enter** button to select it.

NOTE

When setting Ethernet values (IP address, default gateway, etc.), press the Up arrow button to insert additional digit spaces. Press the Down arrow to remove digit spaces (see "Network Setup Menu" on page 35 for more information).

OUT OF RANGE screen

When editing numeric data the numbers below MIN and MAX indicate valid entry bounds. If you enter a value outside valid bounds, you will be presented with an OUT OF RANGE screen. You may then either return to the register you were editing, or choose to exit.



Confirming Configuration Changes

The CONFIRM screen appears whenever you attempt to change the meter's settings through the front panel. This allows you to abort an unwanted configuration change. The front panel also informs you when an entry is out of range. In either case, you must press the **Alt/Enter** button to return to the previous setup screen.

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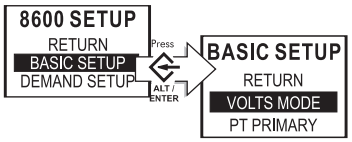
Setup Menus

The following sections describe settings for the Demand Setup, COM Setup and Network Setup menus. Security setup is also discussed.

Setup menus can be accessed with ION software or with the meter's front panel.



Basic Setup Menu

The Basic Setup menu lets you set volts mode, potential transformer (PT) and current transformer (CT) ratios and various other settings (such as I4 and voltage and current polarities) so that you can ensure that your meter is adequately set for your application.

To access the Basic Setup menu with the meter's front panel:

1. Press and hold the **Alt/Enter** button on the front panel of the meter. After about three seconds the Setup screen appears.
2. Use the **Up** or **Down** arrow buttons to navigate to the BASIC SETUP menu. Press the **Alt/Enter** button.
3. Press the **Up** or **Down** arrow buttons to navigate to the appropriate menus (VOLTS MODE, PT PRIMARY, PT SECONDARY, CT PRIMARY, CT SECONDARY).

Many of the settings will be configured when the meter is initially put into service (the device will not operate properly until Volts mode and PT and CT ratios are set), but some settings may need to be changed to refine the device's operation.

NOTE

If you have a hardware-lockable ION8600 meter, you must put the device into TEST mode prior to making changes to the Basic Setup parameters. For TEST mode information, see "TEST mode" on page 28.

The functions of the setup registers in the Basic Setup menu are as follows:

Basic Setup Menu Item	Default Value	Function
Volts mode	*	The power system's configuration and supported Form Factor
PT Primary	120	The Potential Transformer's primary winding rating
PT Secondary	120	The Potential Transformer's secondary winding rating
CT Primary	5	The Current Transformer's primary winding rating
CT Secondary	5	The Current Transformer's secondary winding rating
I4 Primary	5	The Current Transformer's primary winding rating for I4
I4 Secondary	5	The Current Transformer's secondary winding rating for I4
VA Polarity	NORMAL	The polarity of the Potential Transformer on V1
VB Polarity	NORMAL	The polarity of the Potential Transformer on V2
VC Polarity	NORMAL	The polarity of the Potential Transformer on V3
IA Polarity	NORMAL	The polarity of the Current Transformer on I1

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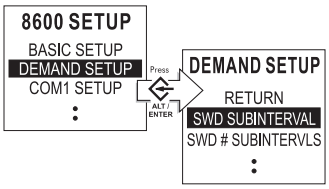
Basic Setup Menu Item	Default Value	Function
IB Polarity	NORMAL	The polarity of the Current Transformer on I2
IC Polarity	NORMAL	The polarity of the Current Transformer on I3
I4 Polarity	NORMAL	The polarity of the Current Transformer on I4
Phase Rotation	ABC	The expected rotation of the voltage phases (ABC or ACB)



Demand Setup Menu

You can access the Demand Setup menu with ION software or with the meter's front panel.

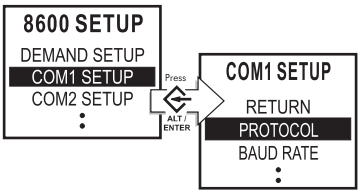
To view the Demand Setup menu with the meter's front panel, press and hold the **Alt/Enter** button, and press the **Up** or **Down** arrow buttons to highlight Demand Setup, and then press the **Alt/Enter** button.

The Demand Setup menu accesses the global settings for all of the revenue related Rolling Block (Sliding Window) Demand and Thermal Demand functionality in the ION8600 meter. The settings provided in the Demand Setup menu control the timing of these demand calculations. The following setup registers and their default settings are displayed:

Setup Register	Default Value	Function
SWD SubInterval	900 s	Specifies the number of seconds in the Rolling Block sub-interval
SWD # SubIntervals	1	Sets the number of sub-interval in the Rolling Blocks
SWD Pred Resp	70	Specifies the speed of the predicted demand output
TD Interval	900 s	Sets the number of seconds in the thermal demand interval
TD Tim Const	90	Sets the rate of the thermal demand output response

NOTE

Refer to "Sliding Window Demand Module Settings" on page 119 and "Thermal Demand Module Settings" on page 120 for complete details about Sliding Window Demand and Thermal Demand modules.



COM Ports Setup Menu

You can access the COM Ports Setup menu with ION Setup software or with the meter's front panel. See "Communications Options" on page 75 for more information.

To make changes to communications settings with the meter's front panel, hold down the **Alt/Enter** button for three seconds to enter the Setup menu, then press the **Down** arrow button to select the COM Setup you want.

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Depending upon the communications options ordered with your meter, the parameter settings available are as follows:

Menu Item	Description
COM1 Setup	Settings for the selectable RS-232 or RS-485 communications port.
COM2 Setup	Settings for the internal modem port.
COM3 Setup	Settings for the optical communications port located on the meter's front panel.
COM4 Setup	Settings for the COM4 RS-485 port.
Network Setup	Settings for the Ethernet communications port.

NOTE

For hardware-lockable meters, you do not need to be in TEST mode to alter these COM port settings.

Serial COM Settings

There are three main parameters that you must set or verify if your meter is connected to a serial network (including modem communications): *Unit ID*, *Baud Rate*, and *Protocol*.

NOTE

Other parameters such as TRANSMIT DELAY, are used in advanced configuration or fine-tuning your system. Settings for the parameters mentioned above are commonly required to get your meter communicating.

You can access serial COM settings with ION Setup software, or with the meter's front panel. To navigate to the *Unit ID*, *baud rate*, and *protocol* settings using the meter's front panel:

1. Press and hold the **Alt/Enter** button on the front panel of the meter. After about three seconds the Setup screen appears.
2. Use the **Up** or **Down** arrow buttons to navigate to the COM port you want to configure. Press the **Alt/Enter** button.

Press the **Up** or **Down** arrow buttons to navigate to PROTOCOL, UNIT ID and BAUD RATE menus.

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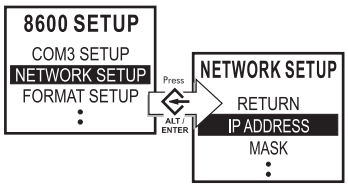
The default configurations are listed in the following COM Setup menu for COM1 (selectable RS-232 or RS-485), COM2 (modem), COM3 (optical port) and COM4 (RS-485).

Serial Port	Setting	Options	Default
All	Protocol	ION, Modbus RTU, Factory, DNP 3.0, GPS Arbiter[1], GPS Arbiter Vorne[1], and GPS:TrueTime/Datum[1], EtherGate[2], ModemGate[2]	ION
All	Baud Rate	300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200 bps	9600 bps
All	Tran Delay	Transmit delay-the bounds are 0.0 to 1.0 s.	0.01s (10ms)
All	Unit ID	Sets the meter Unit ID; a unique Unit ID is required for each device (including all the devices on a ModemGate or EtherGate serial loop)	COM1: Unit ID is based on the serial number.[3] COM2: 101 COM3: 102 COM4: 103
COM1	Mode or Comm mode	The communications mode selected: RS-232 or RS-485	RS-485
COM1 (RS-232 only)	Flow Control	'RTS/CTS' or 'RTS with Delay'; this setting is located in the COM1 Hardware sub-menu	'RTS with Delay'
COM2	Answer HR Rings	The number of rings during defined answer hours – Valid entries for this register are 0-255 rings; an entry of 0 rings will disable answering	1
COM2	Non-Answer HR Rings	The number of rings during defined non-answer hours	5

[1] See "Time Synchronization" on page 116 for more details about GPS settings. See also the technical note *Time Synchronization and Timekeeping* for further details on using the meter's time synchronization functions.

[2] Refer to "Configuring Ethernet Connections" on page 83 and "Internal Modem Connections" on page 88 for more details.

[3] Unit ID for COM1 is based on the meter's serial number. For example, if the serial number is PA-0009B263-01, the Unit ID is set in the factory to 9263.



Network Setup Menu

There are two main parameters that you must set or verify if your meter is connected to an Ethernet network: IP address and Subnet mask address.

NOTE

There are other parameters, such as GATEWAY ADDRESS and SMTP ADDRESS, that are used in advanced configuration or in fine tuning your system. The parameters discussed here are the most common parameters required to get your meter communicating.

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The default configurations for the network settings are as follows:

Setting	Description	Default
IP Address	Sets the IP Address for the meter	None
Subnet Mask	Used if subnetting applies to your network – see your Network Administrator to determine if Subnet Mask is used	None
Gateway	Used in multiple network configurations – see your Network Administrator to determine if Gateway is used	None
SMTP Address	Sets the IP Address for the SMTP Mail Server that is configured to forward mail from the meter to the final destination – see your Network Administrator to determine if the SMTP Mail Server is used	None
SMTP Timeout	Specifies the connection timeout for the SMTP Server	1 minute

Network settings can be configured through the front panel.

⚠ CAUTION

Configuring the IP Address, Subnet Mask, and Gateway registers incorrectly can cause network disruptions. See your network administrator for more information.

Typically, your Network Administrator will provide you with the appropriate IP Address for the meter. The Subnet Mask and Gateway settings are only required if you have communications between multiple Ethernet networks and if subnetting is implemented.

Use the Navigation buttons to edit the values of the network settings so that they match your system addresses. As you configure the network addresses, the front panel automatically discards unnecessary leading zeroes from each three-digit grouping. The hidden leading zeroes appear (and disappear again) as you move the position of cursor across the network address.

In the example above, the highlighted zero is discarded as soon as you change the position of the cursor.

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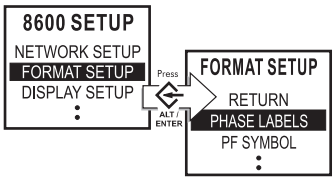
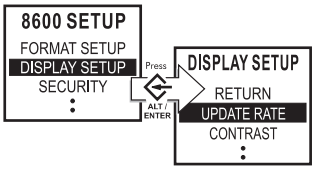


Format Setup Menu

Format Setup contains the following values that set labeling and formatting preferences.

Menu Item	Description
Phase Labels	ABC, 123, RWB, RYB, XYZ, or RST
PF Symbol	Power Factor Symbols can be: LD/LG, +/-, or CAP/IND.
Digit Group	Numbers of three digits or greater can be grouped in any of the following three formats: 1000.0 (no commas, no spaces) or 1,000.0 (commas, no spaces) or 1 000.0 (no commas, spaces).
Date Format	The date can be expressed in any of three formats: DD/MM/YYYY, YYYY/MM/DD, and MM/DD/YYYY.
Show DST	You can choose to display Daylight Savings Time (DST) or not.
Volts Decimal, Current Decimal, and Power Decimal	You can have voltage, current, and power measurements shown to one, two, or three decimals of accuracy. The default value is two decimals of accuracy.



Display Setup Menu

You can configure the following display preferences within Display Setup.

Menu Item	Description
Update Rate	The front panel can update its data from every one to every six seconds. The default update time is one second.
Contrast	A front panel display contrast level can be set from zero to nine where higher numbers represent a sharper level of contrast. The default level is five. The contrast level may be adjusted at any time by pressing and holding down both Up and Down arrow buttons simultaneously.
Backlight Timeout	This selection allows you to make the backlight turn off automatically after zero to 7200 seconds (two hours). The default is 300 seconds (five minutes). If this value is set to 0 (zero), the backlight will always be on.
DMD Lock	Demand lockout time (in seconds) controls the minimum allowable time between consecutive demand resets. You may select values from 0 (disabled) to 5184000 (60 days). The default is 216000 (25 days).
TEST mode TO	If there are no front panel key presses, the meter will exit TEST mode automatically; the TEST mode time-out setting defines how long the meter remains in TEST mode before switching to norm mode. While in TEST mode, the value on the bottom right of the status bar indicates the amount of time before TEST mode times out. The default TEST mode time-out value is 30 minutes.
Display Scale	Scale applied to values before they are displayed. Default is 1000.
Scaling Mode	Specifies whether values are divided or multiplied by the Display Scale before being displayed. Default is Divide.
Delta Vectors	Specifies how vector diagrams are displayed when in Delta mode. Default setting is Instrument.

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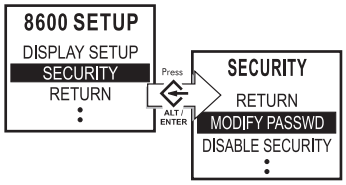

Security Menu

The settings in the front panel Security menu item allow you to:

- modify the existing meter password or reset it to the factory default.
- disable the password security check.
- enable web browser configuration on the meter.

You require the valid password to enter the Security Settings menu. The default password is 0 (zero).

See "Meter Security Features" on page 52 for more details.

NOTE

The password enables users to change the configuration of the meter. It is recommended that you change your password from the default when you put the meter into service

If you have not yet entered your password, the meter's front panel requires that you enter it before you can view the Security Setup menu. Use the Navigation buttons to enter numerical data. If you enter an incorrect password, the front panel will display an "invalid password" message and you will have to try again.

Modify Password Sub-Menu

Use this sub-menu to change the password, or to reset the password to the factory default (0).

From the meter's front panel select SECURITY, then MODIFY PASSWORD. Two choices appear: MODIFY PASSWORD or FACTORY DEFAULT. Use the Up button to select MODIFY PASSWORD, or the Down button to select FACTORY DEFAULT.

Changing a password

- To change the value of a highlighted digit, use the **Up** or **Down** arrow buttons.
- To change the position of the cursor one space to the ***left***, press the **Up** arrow button for about one second.
- To change the position of the cursor one space to the ***right***, press the **Down** arrow button for about one second.
- When the correct password is displayed press **Alt/Enter**.

Disable Security Sub-Menu

Use this sub-menu to enable and disable password security on the meter. Disabling the password allows changes to all the meter's settings through the front panel without a security check.

⚠ CAUTION

Non-secure access to critical settings in the meter, such as PT and CT ratios, is not advisable. It is highly recommended that any meters in the field have the password security check enabled.

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When you re-enable password security, the password is reset to the factory default of 0 (zero). You should re-enter a custom password at this point.

Disabling the Password Security Check is necessary to write to the meter when it is a Modbus Slave device. Refer to “The Meter as Modbus Slave” on page 97 for details about configuring your meter for third-party systems.

Web Config

Use this setting to enable/disable web browser configuration of the meter. See “Enabling and Disabling Web Config Access” on page 56 for more details.

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Chapter
3

Templates and Firmware

Your meter comes installed with a pre-configured default template. This template contains various frameworks which provide all the power measuring and analyzing functionality of the meter. Templates and frameworks can be used immediately without any user configuration ("right out of the box"). They can also be customized, reconfigured, and pasted from one meter to another.

For more information on templates, frameworks and ION modules, see the *ION Reference*.

Your meter's operating system is known as firmware. When newer firmware is available for your meter, simply upgrade to the latest version for all the added features and functionality.

In this chapter

- **Factory Information** **42**
  - Factory Module Settings 42
  - How to TAG Your Meter 42
- **Restoring the Factory Configuration** **43**
  - Using the front panel 43
  - Using ION Setup 43
  - Using Designer 44
- Upgrading Your Meter 45

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Factory Information

The Factory module displays firmware version, serial number and other device information in read-only setup registers (read-only registers can be viewed but not changed).

Factory Module Settings

The device information provided is as follows:

Setup Register	Description
Device Type	A device type identifier (e.g. "8600" for the ION8600)
Compliance	A statement of whether the device is ION compliant or not
Options	Shows model number of meter
Revision	The meter's firmware version
Serial Num	The meter's serial number
ION Version	The ION version supported by the device
Template	The name of the template (framework) installed on the device at the factory
Nom Freq	The expected frequency of the power system being monitored

The Factory module also contains numerous read-only setup registers that hold the calibration constants used at the factory.

How to TAG Your Meter

Three configurable setup registers are provided for you to enter your company name and other text information you want stored in the meter:

Owner - This is a text register for storing user information (e.g. company name); it can be up to 255 characters in length.

Tag 1 - This is a text register for storing user information (e.g. device location); it can be up to 15 characters in length.

Tag 2 - This is a text register for storing user information (e.g. device number or identifier); it can be up to 15 characters in length

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Restoring the Factory Configuration

If you have made changes to the default functionality and want to return to the factory configuration, you can re-initialize the factory configuration in the meter using ION software. The basic setup of the device can be retained, so the meter does not need to be taken out of service for a long period of time.

NOTE

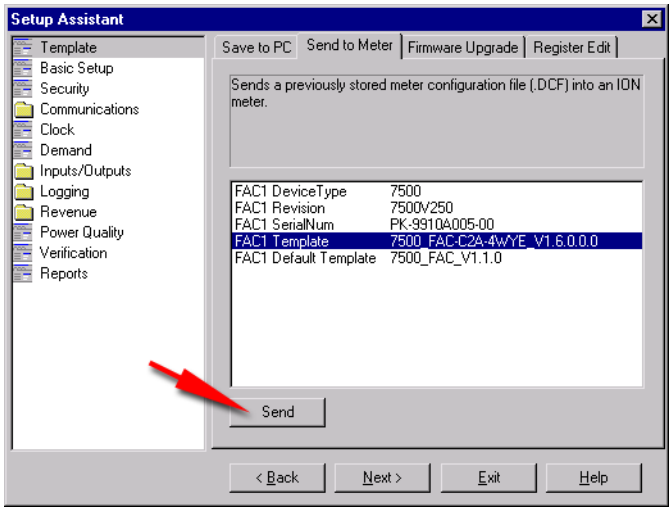
If you restore the factory configuration, all custom features you have created are lost.

Using the front panel

You cannot restore the factory configuration from the meter's front panel.

Using ION Setup

1. Download your device's latest template from the PowerLogic website. Save the .DCF file in the .../ION Setup/TEMPLATE folder for easy access.
2. Connect to your meter in ION Setup, using Basic Mode.
3. Navigate to Setup Assistant > Template.
4. Click the Send to Meter tab and click the Send button.



5. Select the .DCF file from the TEMPLATE folder and click OK.

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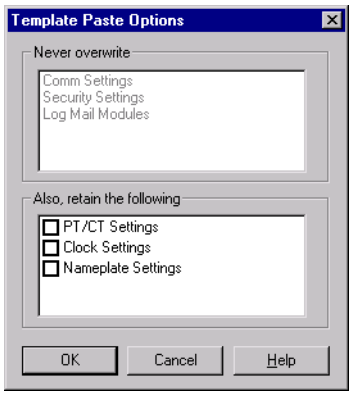
6. The Template Paste Options screen appears. Select the check boxes for the settings you wish to retain (not overwrite) and click OK.



Rapid Meter Programming pastes the template onto your meter. A dialog box confirms the paste was successful.

Using Designer

1. Display the meter's main Configuration screen in Designer.
2. Choose Select All from the Edit menu, then press Delete.

   The confirmation dialog box appears explaining that some modules will not be deleted (core modules cannot be deleted — scroll down in the dialog to see which standard modules will be deleted).
3. Click OK on the confirmation dialog box.

   After a brief wait the modules are deleted, and the main meter Configuration screen is blank except for the Frameworks folder in the Advanced Setup area. (The Frameworks folder contains the folder of Core modules which cannot be deleted.)
4. Choose Select All from the Edit menu to select the Frameworks folder. This selects all sub-folders and modules within the folder.
5. In the Edit menu, choose Paste from Framework, then select the appropriate.fwn file from the folder \ION Enterprise\config\fmwk\nd\. Click OK.

   The Factory module's Default Template register tells you the filename for the default factory framework. (For details about framework files, contact Customer Service or visit the Support area of the PowerLogic website.)
6. Click Open. The Paste Summary window appears.
7. Click on the first module, scroll down to the last module, hold the Shift key and click on the last module. This selects all of the modules.
8. While holding the Shift key, click on the check box to the left of the module name so you see a lock icon with a green check mark.

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⚠ CAUTION

Persistent modules can be overwritten in Designer. When pasting a default framework onto a meter, use lock-paste on the Persistent modules, not free-paste. A list of Persistent modules is available from Customer Service.

9. Check "Maintain external inputs" and click OK on the confirmation dialog box.

   A message appears indicating that Designer is pasting modules. All modules are selected when the paste is complete. Click anywhere in the background of the node diagram to deselect all of the modules.

10. Click the Power Meter shortcut in the Basic Configuration area to select it. Once selected, click Reset in the Designer toolbar, or select Reset from the Edit menu. This reverts the Power Meter to the settings it had before you deleted any modules (retaining the basic setup you previously had).

11. Choose Send & Save from the File menu. The factory configuration is now restored and any custom functionality you created is removed.

NOTE

The time required to complete steps 3, 5, and 11 may vary depending on your connection and the meter configuration.

Upgrading Your Meter

See the *Upgrading ION Device Firmware* technical note for details.

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Chapter
4

Basic Setup

This chapter explains how to perform basic meter setup via the front panel and using ION software.

In this chapter

- **Introduction 48**
  - Configuring Basic Setup 48
    - Using the Front Panel 48
    - Using ION Setup 48
    - Using Designer 49
  - Power Meter Module Settings 50

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Introduction

Basic configuration of the meter is provided by the Power Meter module. The Power Meter module is the main connection between the power system measurements and all other ION modules in the device. This module reports the values for all voltage, current and power measurements. The Power Meter module's setup registers describe details of the power system being monitored. Many of the Power Meter module's setup registers are configured when the meter is initially put into service, although the device cannot operate properly until the Volts Mode and PT and CT ratios are set. Some registers may need to be changed to refine the device's operation. See the *ION Reference* for more details on the Power Meter module.

Configuring Basic Setup

Use the front panel or ION software to perform basic meter setup.

Using the Front Panel

The Basic Setup menu item provides access to the following power system settings.

Menu	Setting	Description	Range (Values)	Default
Basic Setup	Volts Mode	The power system's configuration – WYE, DELTA, etc.	9S 4W-WYE/DELTA 35S 3 Wire 36S 4 W-WYE DEMO	4W-WYE
	PT Primary	The Potential Transformer's primary winding voltage rating	1 to 999,999,999	120
	PT Secondary	The Potential Transformer's secondary winding voltage rating	1 to 999,999,999	120
	CT Primary	The Current Transformer's primary winding current rating	1 to 999,999,999	5
	CT Secondary	The Current Transformer's secondary winding current rating	1 to 999,999,999	5
	I4 CT Primary	Primary rating for the I4 current transformer (if available)	1.0 - 999,999.00	5
	I4 CT Secondary	Secondary rating for the I4 current transformer (if available)	1.0 - 999,999.00	5
	VA Polarity	The polarity of the Potential Transformer on VA	Normal or Inverted	Normal
	VB Polarity	The polarity of the Potential Transformer on VB	Normal or Inverted	Normal
	VC Polarity	The polarity of the Potential Transformer on VC	Normal or Inverted	Normal
	IA Polarity	The polarity of the Current Transformer on IA	Normal or Inverted	Normal
	IB Polarity	The polarity of the Current Transformer on IB	Normal or Inverted	Normal
	IC Polarity	The polarity of the Current Transformer on IC	Normal or Inverted	Normal
	I4 Polarity	The polarity of the Current Transformer on I4	Normal or Inverted	Normal
	Phase Rotation	Power system's phase rotation	ABC, ACB	ABC

Using ION Setup

The Basic Setup Assistant helps you configure the Power Meter module:

1. Open ION Setup and connect to your meter, using Basic Mode.

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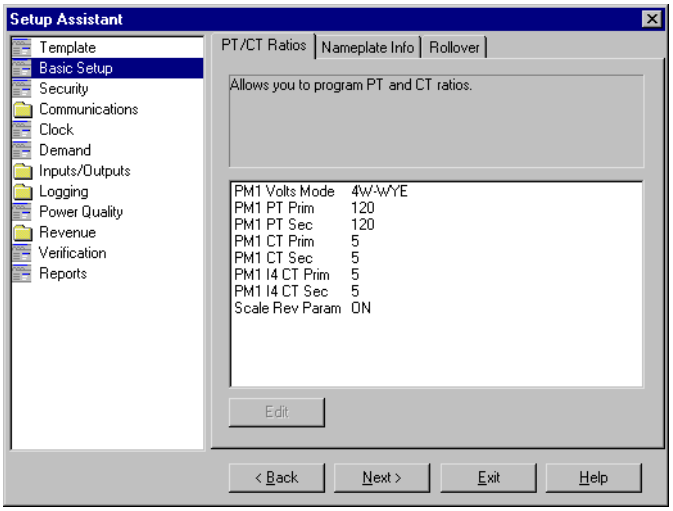
2. In the Setup Assistant, navigate to Basic Setup and click on the PT/CT Ratios tab.



3. Configure each register as required by selecting the parameter and clicking Edit.

Using Designer

Open your meter in Designer and navigate to the Basic Configuration Framework. Right-click on the Power Meter module to edit.

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Power Meter Module Settings

Setup Register	Function	Default
Volts mode [1]	The power system's configuration – WYE, DELTA, Single, etc	4W-WYE
PT Prim [1]	The Potential Transformer's primary winding rating for V1, V2 and V3	120
PT Sec [1]	The Potential Transformer's secondary winding rating for V1, V2 and V3	120
CT Prim [1]	The Current Transformer's primary winding rating for I1, I2 and I3	5
CT Sec [1]	The Current Transformer's secondary winding rating for I1, I2 and I3	5
V4 Prim [1]	The Potential Transformer's primary winding rating for V4	120
V4 Sec [1]	The Potential Transformer's secondary winding rating for V4	120
I4 CT Prim [1]	The Current Transformer's primary winding rating for I4	5
I4 CT Sec [1]	The Current Transformer's secondary winding rating for I4	5
I5 CT Prim [1]	The Current Transformer's primary winding rating for I5	5
I5 CT Sec [1]	The Current Transformer's secondary winding rating for I5	5
Vn Polarity	The polarity of the Potential Transformer on Vn	Normal
In Polarity	The polarity of the Current Transformer on In	Normal
Phase Order	The expected rotation of the voltage phases (ABC or ACB)	ABC
Phase Lbls	The phase label format assigned to the outputs (ABC, RST, XYZ, RYB, RWB or 123)	ABC

[1] The registers are typically set when the device is commissioned. Changing the values of these registers while the device is in service is not recommended.

Once basic setup is performed (i.e. the PT/CT and Volts mode settings), the meter operates properly. Typically there is no need to make further changes to the Power Meter module's setup registers.

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Chapter
5

Security

ION8600 meters offer Standard and Advanced meter security. Standard security is enabled by default from the factory; procedures for changing these security settings using the front panel and ION software are detailed in this chapter. Advanced security, which allows up to 16 users, each with unique access privileges, is discussed as well. This chapter also details some security features available for revenue meters.

In this chapter

- **Meter Security Features** 52
- **Standard Meter Security** 53
  - Configuring standard meter security using the front panel 53
  - Entering the Password 53
  - Changing the Password 54
  - Enabling & Disabling the Password Security Check 55
  - Resetting the Password 56
  - Enabling and Disabling Web Config Access 56
  - Time Synchronization Security Considerations 57
  - Configuring standard meter security in ION Setup 58
  - Configuring standard meter security in Designer 58
  - Scenarios for Standard Security - Front Panel Security Enabled 60
- **Configuring Advanced Meter Security** 63
  - Device Security Access for ION Services 65
  - Scenarios for Advanced Security - Front Panel Security Enabled 67
- **Additional Revenue Metering Security** 70
  - Hardware Lock Security Option 70
- **Anti-Tamper Sealing Methods** 71

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Meter Security Features

Your meter includes the following security features:

Standard meter security

Anytime you make configuration changes to your meter you must enter a password. See “Standard Meter Security” on page 53.

Advanced meter security

This level of security allows configuration of up to 16 users, each with unique access rights to the meter. See the topic “Configuring Advanced Meter Security” on page 63.

Revenue meter security

Your revenue meter can be protected by anti-tamper sealing. See “Additional Revenue Metering Security” on page 70.

Software security

ION software security brings access-level security to the meter. With ION software, you can configure multiple users with different passwords and specify access rights. ION software security only applies to users who are accessing the meter via ION software.

For more information on ION software security, refer to the *ION System Security* technical note.

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Standard Meter Security

Standard meter security is enabled by default on all ION8600 meters; all configuration functions in the front panel are password-protected. The password is factory-set to 0 (zero).

If you make configuration changes to the meter via the front panel, the meter prompts you for its password before accepting any configuration changes. Similarly, if you make any configuration changes via ION software you are prompted by the meter for its password (in addition to the password used to access ION software). Once you enter the correct meter password and confirm the new configuration, the change is set on the meter.

Configuring standard meter security using the front panel

Note that the front panel will prompt you for the meter password before you make your first configuration change. You will not need to re-enter the password for each subsequent change. However, if you perform no additional configuration changes for five minutes, you will need to re-enter the Setup menu and provide the valid meter password to resume making changes. This is because the meter returns from setup mode to data display mode after five minutes of inactivity.

The meter password allows access to the meter's configuration through ION software and the front panel. The default password is 0 (zero).

This section describes the password security options available to front panel users. Step by step instructions are provided on the following procedures:

1. Entering the meter password
2. Changing the meter password
3. Disabling (and Enabling) the password security check

This section also presents security precautions to consider when configuring time synchronization and third party protocols.

Entering the Password

The first time you try to make a change to any setting, you will be presented with the password screen (shown below). After you have entered the correct password, you will not have to re-enter it for other any other changes unless you exit the configuration session.

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NOTE

Once the correct password is entered, you will not have to re-enter the password for any other changes unless you exit configuration.

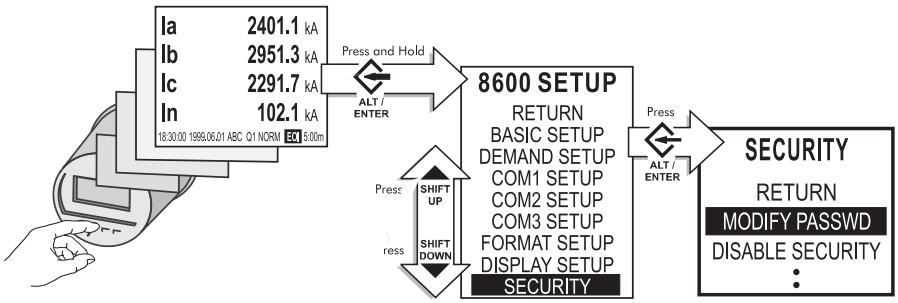
To enter the password:

1. To change the value of the highlighted digit, use the arrow buttons. The up arrow increments the number and the down arrow decrements it.
2. To change the position of the cursor, hold down an arrow button for about one second. The up arrow moves the cursor left one position, and the down arrow moves the cursor right one position.
3. Once you have the value you want, press the **Alt/Enter** button.

Changing the Password

By default, the password is set to 0 (zero) in the factory. The password may be changed to any eight-digit number. It is highly recommended that you change the password from the default value. To change the password:

1. Hold down the **Alt/Enter** button to access the Setup menu.
2. Scroll through the menu items using the arrow buttons, highlight SECURITY.
3. Press the **Alt/Enter** button to select SECURITY.



4. You will be prompted to enter the current meter password (see "Entering the Password", above). Once you enter the password, you are presented with the "MODIFY PASSWD" screen, as seen below:

5. To change the value of the highlighted digit, use the arrow buttons. The up arrow increments the number and the down arrow decrements it.
6. To change the position of the cursor, hold down an arrow button for about one second. The up arrow moves the cursor left one position, and the down arrow moves the cursor right one position.

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7. Once you have the value you want, press the **Alt/Enter** button. You will be prompted for your current password before the new password is saved.

Enabling & Disabling the Password Security Check

Disabling the password allows changes to all the meter's settings through the front panel without a security check. This procedure may only be necessary if the communications interface you are using does not support the meter's security protocols.

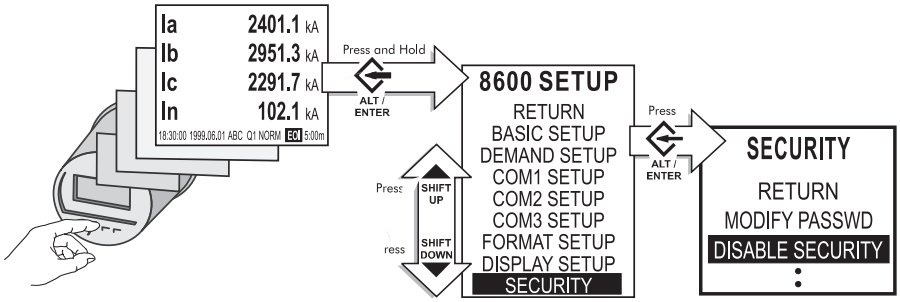
⚠ CAUTION

Non-secure access to critical settings in the meter, such as PT and CT ratios, is not advisable. It is highly recommended that any ION8600 devices in the field have the password security check enabled.

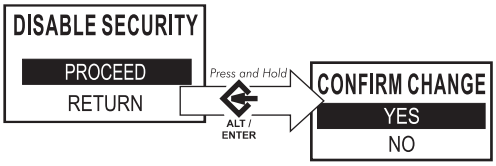
Disabling the Password Security Check

Follow these steps to disable the password security check:

1. Press the **Alt/Enter** button to enter the Setup menu. Scroll down the menu with the arrow button. Press **Alt/Enter** again when SECURITY is highlighted.
2. Enter the valid meter password at the password prompt. You are then presented with the Security menu.
3. Scroll down and highlight the DISABLE SECURITY menu item and press the **Alt/Enter** button.



4. Select PROCEED, then select YES at the following prompt.



   A message appears on screen notifying you of how to re-enable password security (refer to "Enabling the Password Security Check", below). Your meter's password is now disabled; changes to settings in the meter do not require a valid password.

5. Press the **Alt/Enter** button to return to the Setup menu.

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Enabling the Password Security Check

When you re-enable the password security, you are required to enter a new password. To re-enable password security:

1. Press and hold down the **Alt/Enter** button to enter the Setup menu. Scroll down the menu and select SECURITY.
2. From the Security menu, select MODIFY PASSWD, and press the **Alt/Enter** button. The Modify Password Screen appears.
3. The message FAC DEFAULT appears in the middle of the Modify Password screen. If you want to use the factory default password, press the **Alt/Enter** button. If you want to set the password to a different eight-digit number, use the instructions in "Changing the Password" on page 54.
4. Once you have entered your new password, press the **Alt/Enter** button.
5. Select YES to confirm the change and return to the Setup menu.

The password security check is re-enabled, and all changes to the device's configuration require the new meter password.

Resetting the Password

NOTE

If you forget your password, and your meter has the Password Security check enabled, you must remove the meter's outer cover to put the device into TEST mode.

In the event that you forget or lose your meter password, you can reset the password to the factory default value of 0 (zero). Resetting the password requires that the meter be in TEST mode (Refer to "Switching to TEST Mode" on page 179 for details on invoking TEST mode).

If your meter has the Password Security check disabled, you can invoke TEST mode using ION software. If the password security check is enabled (or you have the hardware-locked option) you will have to remove the meter's outer cover to access the TEST Mode button.

Follow these instructions to reset the password to the factory default:

1. Put the device into TEST mode (either through communications or by pressing the TEST Mode button. Refer to "Switching to TEST Mode" on page 179 for details).
2. Once the device is in TEST mode, press and hold down the **Alt/Enter** button and Demand Reset buttons simultaneously.

   A message appears on screen: PASSWORD RESET PASSWORD SET TO DEFAULT. Password Security is now enabled; the meter password is 0 (zero).

Enabling and Disabling Web Config Access

By default, remote configuration of the device via web browser is enabled. Follow these steps to enable or disable your meter's web configuration access.

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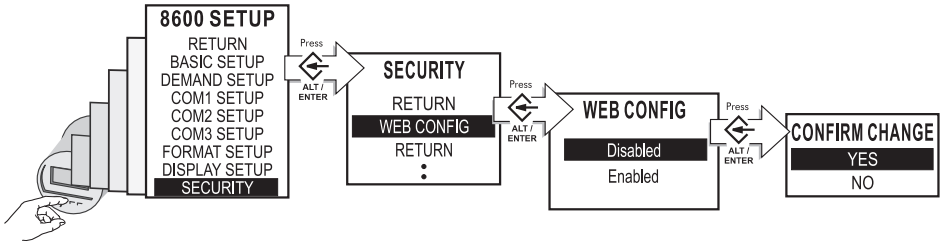
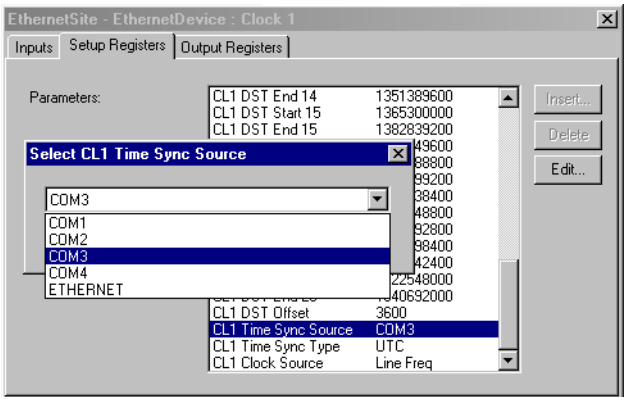
1. Press the **Alt/Enter** button to enter the Setup menu. Scroll down the menu with the arrow button. Press **Alt/Enter** again when SECURITY is highlighted.
2. Enter the valid meter password at the password prompt. You are then presented with the Security menu.
3. Scroll down and highlight the WEB CONFIG menu item and press the **Alt/Enter** button.
4. Select "Enabled" or "Disabled" as appropriate.
5. Confirm the change and select RETURN to go back to the Setup Menu.



Time Synchronization Security Considerations

Depending on ION software settings, a workstation that connects to an ION8600 device may send a time synchronization signal and synchronize the meter's internal clock with the workstation's clock. This could cause overlaps in the Demand intervals, and timestamps in the data logs may not be accurate.

Ensure that the *TimeSynch Source* setup register in the Clock module is set to a secure communications port. By default, the *Time Synch Source* setup register in the Clock module is set to COM3 - the optical port. Time synchronization broadcasts will only be accepted through the optical port in this configuration. The following example is from the Clock module's *Time Synch Source* setup register as seen in ION Setup.



Ensure that time synchronization is disabled on all other ports. Use ION software to disable time synchronization on a communications port; refer to ION Enterprise on-line help.

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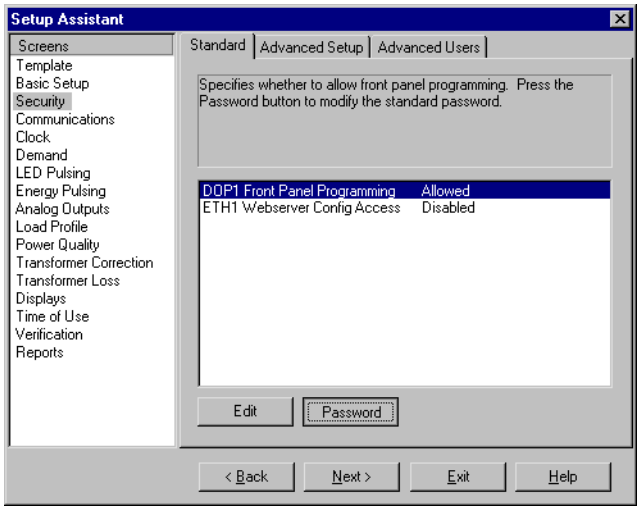
Configuring standard meter security in ION Setup

1. Launch ION Setup with Supervisor authority.
2. Connect to the appropriate meter.
3. Once connected, double-click the Setup Assistant and select the Security heading.
4. Make sure the Standard tab is selected



5. Click Password. The following dialog box appears:

6. Type a new numeric password and confirm by re-typing the password in the fields.

Configuring standard meter security in Designer

1. Launch Designer software with Supervisor access.
2. Select Options > Show Toolbox if the toolbox is not displayed.
3. From the Options menu, select Change Standard Meter Security...

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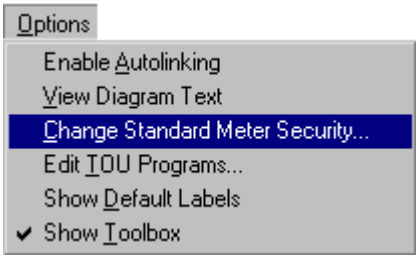
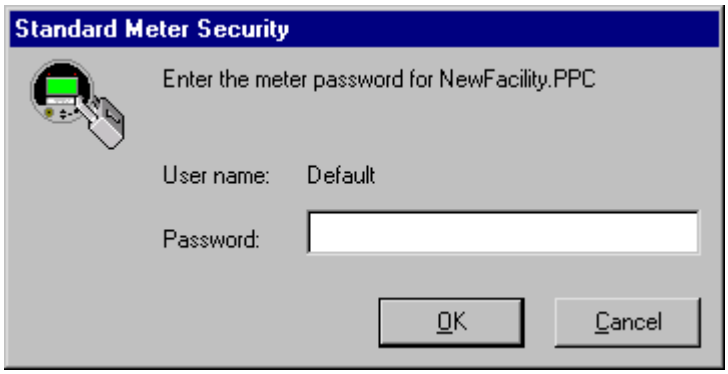


4. Enter the meter password when prompted. You must enter the existing meter password before you can change security settings (the default is zero).



5. Type a new numeric password and confirm by re-typing the password in the fields (see image below). If you are sure you want to disable Standard security, click the Disable Standard Meter Security check box.

⚠ CAUTION

Do not disable security unless it is absolutely necessary. Disabling Standard security leaves your meter configuration open to tampering (intentional or unintentional) through communications and the front panel.

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Scenarios for Standard Security - Front Panel Security Enabled

1. Access through the front panel display

With the Front Panel Security enabled and Front Panel Programming set to "Allowed", you can read metering data from the display. To configure meter parameters, you must enter the numeric password.

If Front Panel Security is disabled and Front Panel Programming is set to "Allowed", you can read metering data from the display and configure or make changes without entering in a password.

If Front Panel Programming is set to "Disallowed", you can read metering data from the display, but you cannot access any of the configuration screens from the front panel display.

2. Access through software talking ION protocol with ION Setup and/or ION Enterprise on ANY comm port (serial, modem, optical and Ethernet)

If you are communicating through ION protocol (and have Front Panel Security enabled) with the appropriate software access, you can read and configure meter parameters. When you attempt to write or configure any parameter, you must enter in the numeric password.

3. Access through Modbus on ANY comm port (serial, modem, optical and Ethernet)

On ION meters, Modbus implementation consists of two parts:

i. Modbus Data

- Includes the Modbus Slave ION modules.
- These modules are configurable as to what data is available and where in the range of Modbus registers this data is placed.

ii. Modbus Setup

- Also referred to as the Modbus Map (see Schneider Electric's "*Modbus Protocol*" document).
- Uses fixed functionality and register mapping.

4. Accessing the Modbus data section with Standard Security

When accessing the Modbus Data section with Standard Security enabled, you:

- Can read from the data section at all times.
- Can write to the data section if the Modbus Slave Module is set to "Unsigned 16Bit Input Mode", and the Front Panel Security is disabled or the password is set to zero.

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- Cannot write to the data section if the Front Panel Security is enabled and the password is set to a non-zero value.

5. Accessing the Modbus setup section with Standard Security

When accessing the Modbus Setup Section with Standard Security enabled, you:

- Can read from the setup section at all times.
- Can write to the setup section if the Front Panel Security is disabled or the password is set to zero.
- Cannot write to the setup section if the Front Panel Security is enabled and set to a non-zero value.

Time syncs are considered to be a Modbus Setup parameter and follow the same rules above for writing a time sync to the meter. Also, the ION Clock Module must have its *Time Sync Source* setup register set to the appropriate communication port.

The Modbus Slave module and the Clock module setup registers are only accessible via ION protocol. Their settings are therefore protected by the security settings on the ION device.

6. Access through DNP 3.0 on ANY serial, modem or optical communication port

If you are communicating through DNP 3.0 protocol over any serial, modem or optical port (and Front Panel Security is enabled), you can read data from the default DNP 3.0 Map without having to enter the numeric password.

If the DNP 3.0 Map is changed to expose control and setup parameters, then you could write to the custom DNP 3.0 Map. The DNP 3.0 Map can only be changed by using ION Setup or ION Enterprise and then the customer must know the numeric password. Time syncs can be sent to the meter in this mode.

7. Access through a standard browser on an Ethernet port via HTTP protocol

If the Front Panel Security is enabled and Webserver Configuration Access is enabled then you will be prompted for the password by your web browser before being allowed to make any configuration changes to the meter. If the Front Panel Security is not enabled, then you will be able to make configuration changes without having to supply the password.

If Webserver Configuration Access is disabled, you can only read data. The default Webserver pages contain real-time data only.

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8. Access through FACTORY protocol on a Telnet connection via Ethernet or HyperTerminal on a serial, modem, or optical port

If the Front Panel Security is enabled, you must enter the numeric password to log into the Factory protocol. If Front Panel Security is disabled, logging in via Factory protocol does not require a password.

Once logged in, you can change the following:

3. IP Address
4. Subnet Mask
5. Gateway
6. Reset Battery Counters
7. Enable/Disable Front Panel Security

If you wish to change additional configuration settings beyond the above list, contact Schneider Electric.

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Configuring Advanced Meter Security

Advanced meter security is available on ION8600 meters. This level of security allows configuration of up to 16 users, each with unique access rights to the meter. Access rights consist of the following levels where you can:

- **Read:** view any parameter except the security configuration.
- **Peak Demand Reset:** perform a reset of peak demand values (for example, sliding window demand for kW, kVAR, kVA etc.).
- **Timesync:** set the time on the meter.
- **Full Meter Configuration:** configure any programmable register on the meter except for registers related to the security setup, registers that result in a demand reset, or actions that place the meter in test mode.
- **TEST Mode:** put the meter into test mode.
- **Advanced Security Configuration:** configure Advanced security for the meter, full meter configuration must also be set to YES.

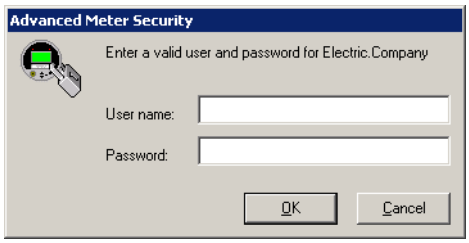
When configuring users, in most cases you must set Read access to YES. However, you can set up a user without read access; for example, you may want to create a user who can only timesync the meter. In some cases (such as Advanced security configuration access) you must set multiple access options to YES. When you are configuring Advanced security, the software rejects unacceptable or unsafe user configurations.

NOTE

Use only ION Enterprise or ION Setup (version 1.1 and later) to configure Advanced security. ION Setup has a Setup Assistant that guides you through Advanced security setup.

Entering an advanced security user name and password

When you attempt to view data or make a change to a meter that has advanced security enabled, you are prompted for a user name and password.



1. Enter the valid Advanced security user name.

NOTE

User names are fixed as USER1 through to USER16.

2. Enter the appropriate password and click OK.

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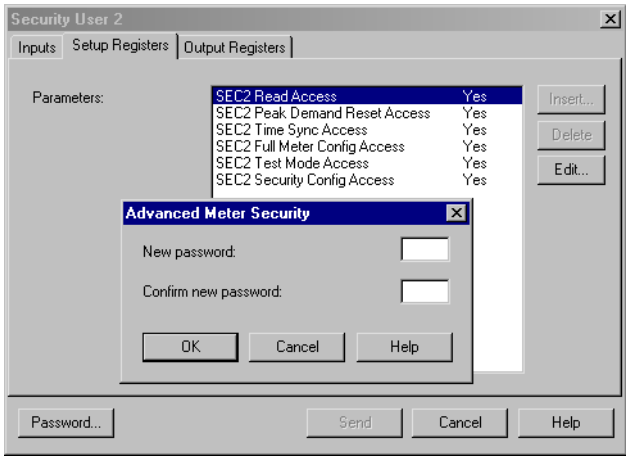
Configuring advanced security using ION Setup

If you are using ION Setup software follow the instructions below.

1. Launch ION Setup with Supervisor access.
2. Connect to the meter you want to configure with Advanced security.
3. Once connected, double-click the Setup Assistant in the right-hand column of the Network Viewer.
4. Select the Security heading in the left-hand column of the Setup Assistant. Click the Advanced Setup tab.
5. Click the SOP1 Enable Advanced Security listing. Click Edit.
6. Select the Enabled setting. You will be prompted with a warning screen. Click Yes.

Configuring advanced users with ION Setup

1. Click the Advanced Users tab in the Security setup screen.
2. Click the Add User button. ION Setup automatically adds a new user.
3. Select the new user listing and click Edit. The following dialog box appears:



Use the available settings to configure access levels for the new user. Passwords can also be changed from this screen.

4. Click Send to send the changes to the meter.

Configuring advanced security using ION Enterprise

If you are using Designer software follow the instructions below.

1. Launch Designer software with Supervisor access. From the File menu choose Open... and select the meter you want to configure with Advanced security.
2. If the toolbox is not displayed, choose Options from the main menu and select Show Toolbox.
3. If you do not want to allow front panel programming using the Standard security meter password then double-click on the Display Options module and change the Front Panel Programming register to disallow.

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NOTE

If you allow front panel programming when you set up Advanced security, the meter password (used in Standard security) is still active through the front panel. You may need to allow front panel programming if someone installs the meter in the field and needs to make setup modifications. Once the meter is installed, you can disallow front panel programming so that Advanced security user names and passwords must be used to view or change meter information.

4. Double-click on the Meter Security Setup folder.

   For each user you want to configure, drag out a Security User module from the Toolbox, and modify the appropriate access level setup registers.

5. Click the Change Password button at the bottom left of the module setup screen to configure a password. The default password is zero (0).

   Click OK when you have configured the users.

6. Right-click on the Security Options module.

7. Double-click on any setup register and use the drop-down menu to change the register setting or label.

   You must set the 'Enable Advanced Security' register to Enabled. Refer to the Security Options module description in the ION software online help for more details.

8. From the File menu choose Send & Save. Advanced security is now enabled on the meter.

Device Security Access for ION Services

Many ION Services need constant access to your network's ION devices. These services include the ION Log Server, the VIP and Site Server that perform the following type of functions:

Service	Function
ION Log Server	Reads the ION meter Data Recorder or waveform modules and can automatically rearm recorders that are configured as Stop-When-Full
VIP	Can be configured to read from a meter or perform control action using Distributed Control.
Site Server	Broadcasts time signals to the meter.

When Advanced meter security is enabled, these services may not have sufficient access rights to perform their operations. You must specify a user with sufficient access rights for these services.

NOTE

You may want to configure a separate user for accessing services. If you observe trouble with ION software accessing the meter, it is likely that these services either do not have access rights or the original user name and password have changed.

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Allowing ION Services access to advanced security enabled meters (ION Enterprise)

1. Launch the Management Console and click Devices on the Management Console's System Setup Pane.
2. Highlight the ION device (or select multiple devices) with Advanced security enabled, right-click and select Security... The following window displays.

Advanced Meter Security Settings
These settings are used by the software to gain access to a security-enabled device.
ION Services Access:
USER1
Send Security Timesyncs to this device
Change Password
OK
Cancel

3. Select the user name you want from the drop down menu. Once you select a user the Change Password button is active. Click the check box if you want to allow this user to send time synchronization signals to the meter. Click OK.
4. Enter the valid password, re-type the password to confirm and click OK.

Allowing ION Services access to Standard security enabled meters (ION Enterprise)

1. Launch the Management Console and click Devices on the Management Console's System Setup Pane.
2. Highlight the ION device (or select multiple devices) with Standard security enabled, right-click and select Security....
3. Select Standard Security from the drop down menu. Click the check box if you want to allow this user to send time synchronization signals to the meter. Click OK.
4. Enter the valid meter password for Standard Security, re-type the password to confirm, and click OK.

Allowing ION Services access to advanced security enabled meters (ION Setup)

1. Launch ION Setup and connect to the appropriate meter.
2. Once connected, open the Setup Assistant and select Security from the left-hand column. Make sure Advanced Security is enabled in the Setup Assistant.

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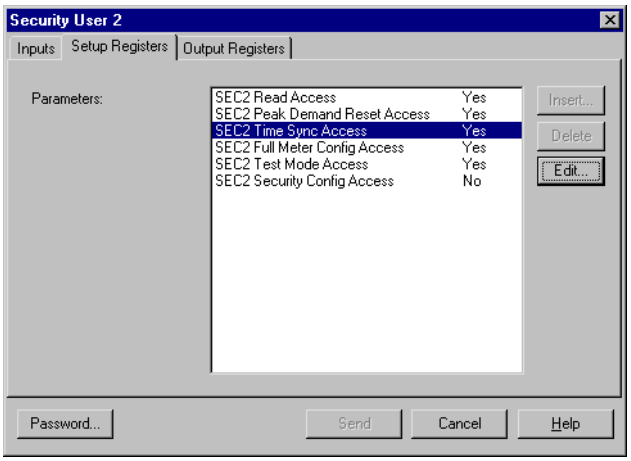
3. Select the user name you want from the available list. Click the Edit button. The following window appears:



4. Click Time Sync Access from the available settings list. If you want to allow this user to send time synchronization signals to the meter, ensure the setting reads Yes. To change the setting, click the Edit button and make the appropriate changes.

Scenarios for Advanced Security - Front Panel Security Enabled

1. Access through the front panel display

With both Advanced Security and Front Panel Security enabled, you can read the metering data on the display. To configure/write to the meter, enter the numeric password. Advanced Security does not add additional security when accessing the meter through the front panel.

2. Access through software talking ION protocol with ION Setup and/or ION Enterprise on ANY comm port (serial, modem, optical and Ethernet)

With Advanced Security enabled and communicating through ION protocol on any communication port, you must enter a username and password in order to read or configure/write the meter. Advanced Security blocks access to the device if you do not know the correct username and password. If you know the username and password, and the username is assigned the proper access, then you can read and configure/write (depending on the assigned user-access rights) data within the meter. Refer to page 63 for details on setting up Advanced Security and how to assign user access rights.

3. Access Through Modbus on ANY comm port (serial, modem, optical and Ethernet)

On ION meters, Modbus implementation consists of two parts:

i. Modbus Data

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- Includes the Modbus Slave ION modules.
- These modules are configurable as to what data is available and where in the range of Modbus registers this data is placed.

ii. Modbus Setup

- Also referred to as the Modbus Map (see Schneider Electric's "*Modbus Protocol*" document.
- Uses fixed functionality and register mapping.

From an Advanced Security point of view, however, the Modbus Data and Setup sections operate somewhat differently.

When accessing the Modbus Data Section with Advanced Security Enabled, you:

- Can still read from the data section at all times.
- Can write to the data section if the Modbus Slave Module is set to "Unsigned 16Bit Input Mode", and the "Modbus Map Access" is set to "Yes".
- Cannot write to the data section if "Modbus Map Access" is set to "No".

When accessing the Modbus Setup Section with Advanced Security Enabled, you:

- Can read from and write to the data section if "Modbus Map Access" is set to "Yes".
- Cannot read from or write to the data section if "MODBUS Map Access" is set to "No".

You can write a time sync only if "MODBUS Map Access" and "Allow Broadcast Time syncs" are both set to "Yes", and the ION Clock Module's "Time Sync Source" setup register is set to the appropriate communication port.

Since the Modbus Map Access, the Modbus Slave module, and the Clock module setup registers are only accessible via ION protocol, their settings are protected by the security settings on the ION device.

4. Access through DNP 3.0 on ANY serial, modem or optical port

With Advanced Security enabled and communicating through DNP 3.0 protocol over any serial, modem or optical port, you can read from the default DNP 3.0 Map. If the DNP 3.0 Map is changed to expose control and setup parameters, then you can write to the custom DNP 3.0 Map. Any changes to the DNP 3.0 Map or the Security Options Module can only be changed by using ION Setup or ION Enterprise and the customer must know the proper Advanced Security username and password. Time syncs can be sent to the meter in this mode without having to enter in a username and password.

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5. Access through a standard browser on an Ethernet port via http protocol

If Advanced Security is enabled and the Web Access Read Security setup register in the Security Options Module is set to YES, you must enter in the proper Advanced Security username and password before gaining read access to the device through a standard browser. If you have the proper username and password, the next level of security is the Webserver Configuration Access setting. If the Webserver Configuration Access disabled, you can only read metering data.

If the Web Access Read Security setup register is set to NO, then you will be able to read web pages on the device without having to provide an Advanced Security username and password. However, if you attempt to make configuration changes, you will be prompted for the Advanced Security username and password.

6. Access Through FACTORY protocol on a Telnet connection via Ethernet or HyperTerminal on a serial, modem, or optical port

Advanced Security does not affect the Factory protocol. Therefore, if Front Panel Security is enabled, you will have to enter the password to log into the Factory protocol. If the Front Panel Security is disabled you can log into the Factory protocol without supplying a password.

Once logged in, you can change the following:

3. IP Address
4. Subnet Mask
5. Gateway
6. Reset Battery Counters
7. Enable/Disable Front Panel Security

If you wish to change additional configuration settings beyond the items listed above, you must contact Schneider Electric.

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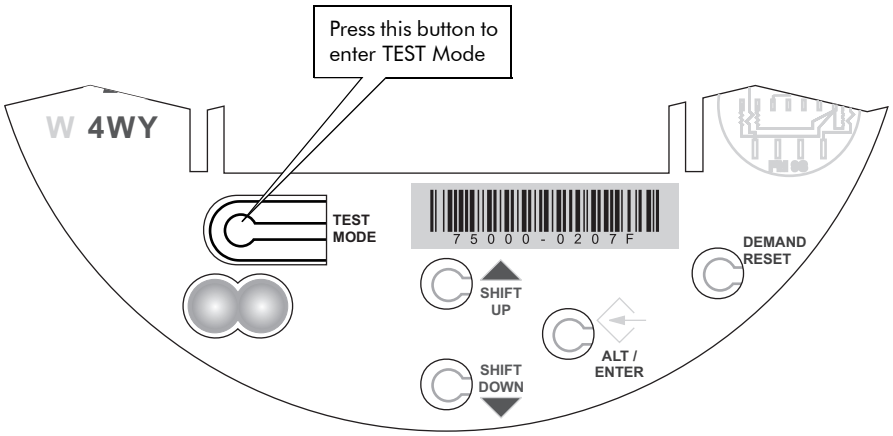
Additional Revenue Metering Security

To meet government regulations and utility security requirements, the revenue meter incorporates additional security systems:

- a hardware-locked security system that prevents modification of revenue quantities after the meter is sealed.
- a traditional anti-tamper mechanical seal on the meter base unit.

Hardware Lock Security Option

The hardware-locked security feature is an ordering option for some ION8600 meters. This hardware lock is factory set; to make configuration changes to billing parameters on a hardware-locked meter, you must first place the meter in TEST mode. The TEST mode button is located under the anti-tamper sealed outer cover. This button cannot be activated remotely with a Hardware Lock meter.



The Hardware Lock Option can be combined with Advanced Security and the Front Panel Security to offer the highest level of security. Once the TEST button is activated, all rules above for Advanced and Standard Security still apply. When the TEST Button is not activated, no changes to the locked parameters can be made. Those parameters that are not locked are outside the revenue metering space. However if Advanced Security and Front Panel Security are enabled, the unlocked portion of the meter is secured by the rules for Advanced and Standard Security.

In certain countries the meter is no longer revenue certified if the hardware lock is broken.

Typical values that are protected include:

- kWh, kVARh, kVAh delivered, received, del-rec, del+rec.
- kW, kVAR, kVA Thermal and Sliding Window demand min and max values.
- Digital Outputs controlling the energy pulsing applications.
- All Power system settings, including PT and CT ratios.

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Locked Module Listings

For a complete list of locked modules specific to your meter and its firmware, please download the *ION Device Templates* help file from the PowerLogic website.

Anti-Tamper Sealing Methods

The ION8600 meter uses the following anti-tamper sealing methods.

Demand Reset Switch Seal

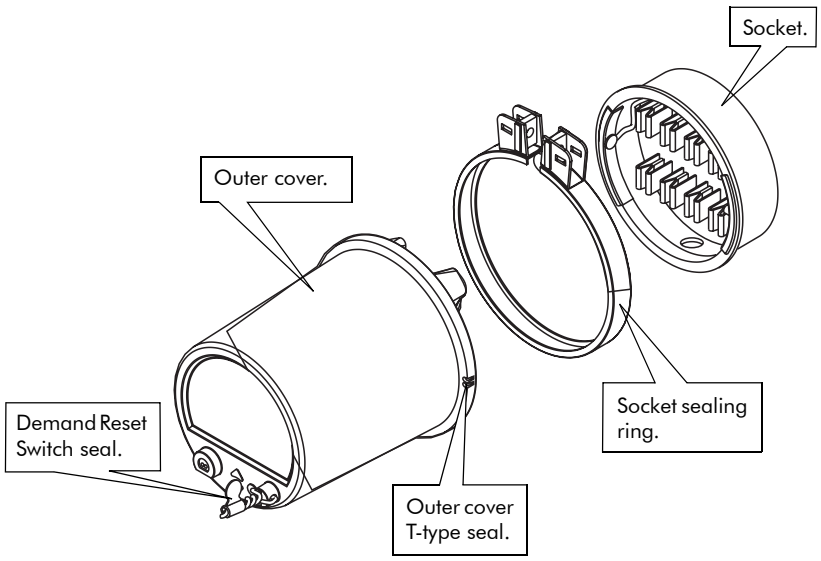
The Demand Reset switch located on the front panel may be sealed by a wire seal or lock inserted through the side of the switch. This seal does not have to be broken to remove the meter's cover.

Socket Seals

A standard ANSI C12.7 type socket-sealing ring may be in place to hold the meter to the socket. When removing the outer cover, the sealing ring must first be removed. Some socket sealing rings facilitate wire seals.

Outer Cover Seals

The outer cover of the meter is factory sealed to its backplate with a T-type seal. Depending on the installation, this seal may be inaccessible after the meter is installed until you remove the device from the socket.



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Chapter 6

Communications

This chapter includes general instructions for connecting and configuring all the communication ports on your meter.

For specific installation steps and meter specifications, consult your *ION8600 Installation Guide*.

In this chapter

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- **Communications Options** 75
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  - Optional Switchboard Breakout Panel 75
  - Optional IRIG-B GPS Time Synchronization 75
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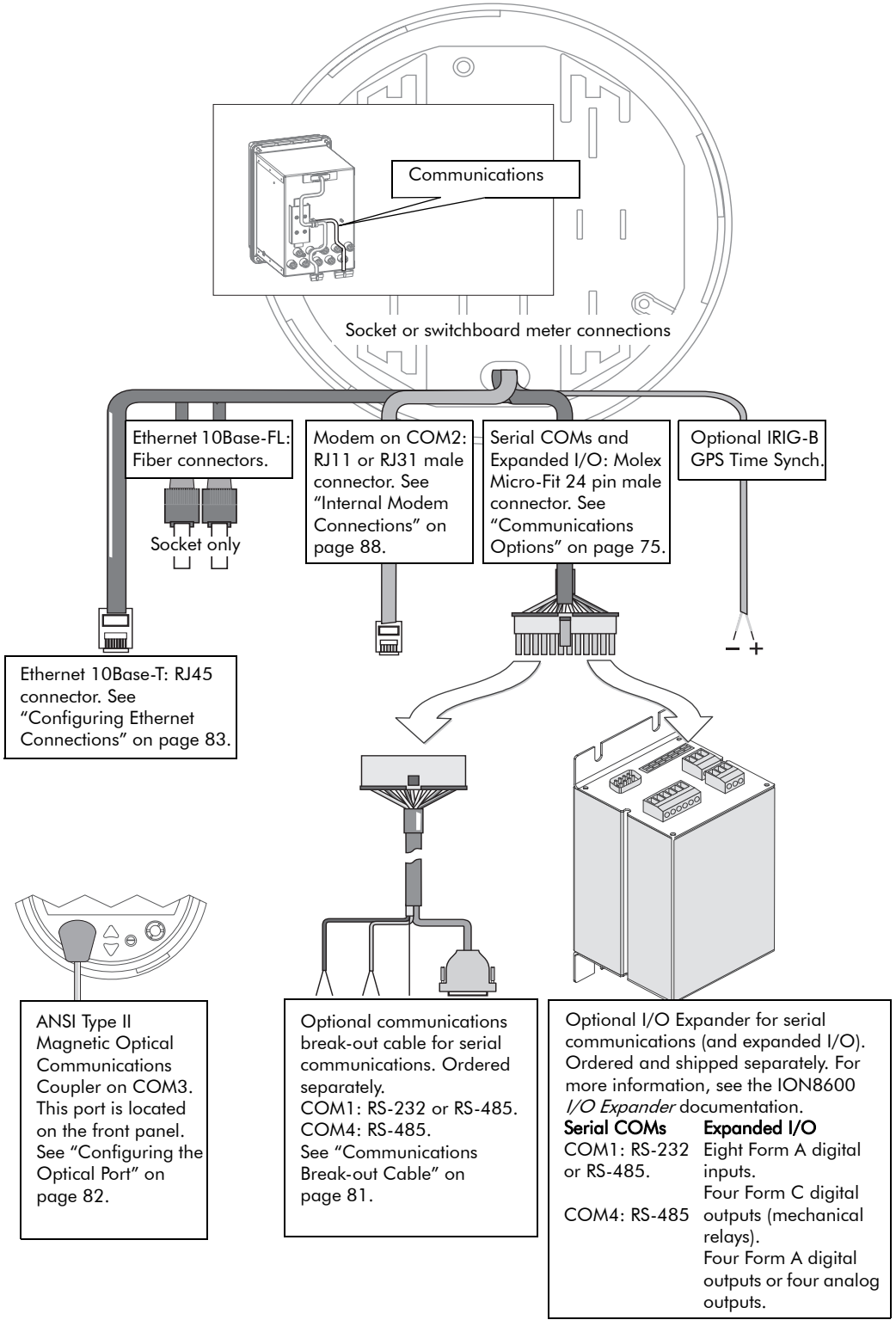
Communications Overview

The following illustration shows all the possible connections to the communications card.


Communications
Socket or switchboard meter connections
Ethernet 10Base-FL: Fiber connectors.
Socket only
Modem on COM2: RJ11 or RJ31 male connector. See "Internal Modem Connections" on page 88.
Serial COMs and Expanded I/O: Molex Micro-Fit 24 pin male connector. See "Communications Options" on page 75.
Optional IRIG-B GPS Time Synch.
– +
Ethernet 10Base-T: RJ45 connector. See "Configuring Ethernet Connections" on page 83.
ANSI Type II Magnetic Optical Communications Coupler on COM3. This port is located on the front panel. See "Configuring the Optical Port" on page 82.
Optional communications break-out cable for serial communications. Ordered separately.
COM1: RS-232 or RS-485.
COM4: RS-485.
See "Communications Break-out Cable" on page 81.
Optional I/O Expander for serial communications (and expanded I/O). Ordered and shipped separately. For more information, see the ION8600 I/O Expander documentation.
Serial COMs
COM1: RS-232 or RS-485.
COM4: RS-485
Expanded I/O
Eight Form A digital inputs.
Four Form C digital outputs (mechanical relays).
Four Form A digital outputs or four analog outputs.

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Communications Options

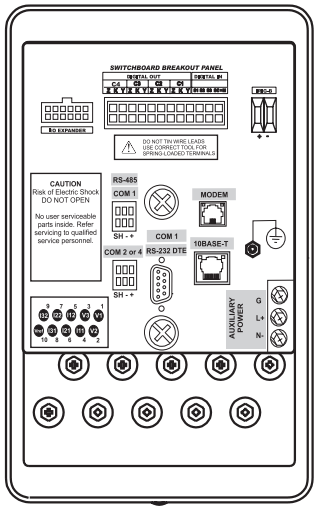
ION8600 meters have numerous communication possibilities depending on your ordering preferences. Not all models have exactly the same communications options available. Refer to the PowerLogic website for the latest ordering options and documentation. All communications ports can be used simultaneously.

Socket and Switchboard Meters

Port	Available Options	Notes
COM1	RS-232 / RS-485	User selectable RS-232 or RS-485
COM2	Internal Modem RJ11 or	Maximum 57.6 kbps baud rate modem.
	Internal Modem RJ31	
COM3	Optical Port	ANSI Type II optical port located at front of meter
COM4	RS-485	
Network	Ethernet RJ45 (10Base-T)	Ethernet Fiber is only available on socket-style meters, not switchboard.
	Ethernet Fiber[1] (10Base-FL)	

[1] Onboard I/O is not available with the Ethernet Fiber option.

Optional Switchboard Breakout Panel



Connector Type	Available	Comments
RS-485	Yes	Captured wire connector
RS-232	Yes	DB9 connector
Internal Modem RJ11	Yes	RJ11 connector
Internal Modem RJ31	No	RJ31 connector
Ethernet RJ45	Yes	RJ45 connector
Ethernet Fiber	No	This option available only on socket-style meters
Onboard I/O expansion	Yes	Captured wire connector (requires onboard expansion I/O card)
IRIG-B	Yes	Captured wire connector (requires optional IRIG-B feature)
Auxiliary Power	Yes	Terminal connectors (requires one of the Auxiliary Power Options)

NOTE

The COMs on an I/O Expander are not enabled when connected to a breakout panel. Use the RS-485 and RS-232 provided on the breakout panel.

Optional IRIG-B GPS Time Synchronization

IRIG-B cannot be configured via the meter's front panel. See the *IRIG-B Product Option* document for configuration procedures.

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Communications Accessories

The following accessories are currently available as separate products:

I/O Expander

The PowerLogic I/O Expander connects with the male Molex connector on the meter to provide I/O capabilities as well as access to standard serial communications ports. Refer to the *I/O Expander Installation Guide* for complete details about this device.

Communications break-out cable

The communications break-out cable connects with the male Molex connector on the meter. This is a pre-made cable that provides access to the standard serial communications ports on the meter.

Molex extension cables

Molex extension cables can be ordered in both 5 and 15 feet (1.5 or 4.5 meters) lengths.

Optical probe

The optical probe attaches to the optical port on the front of the meter and allows on-site communications (e.g. with a laptop computer).

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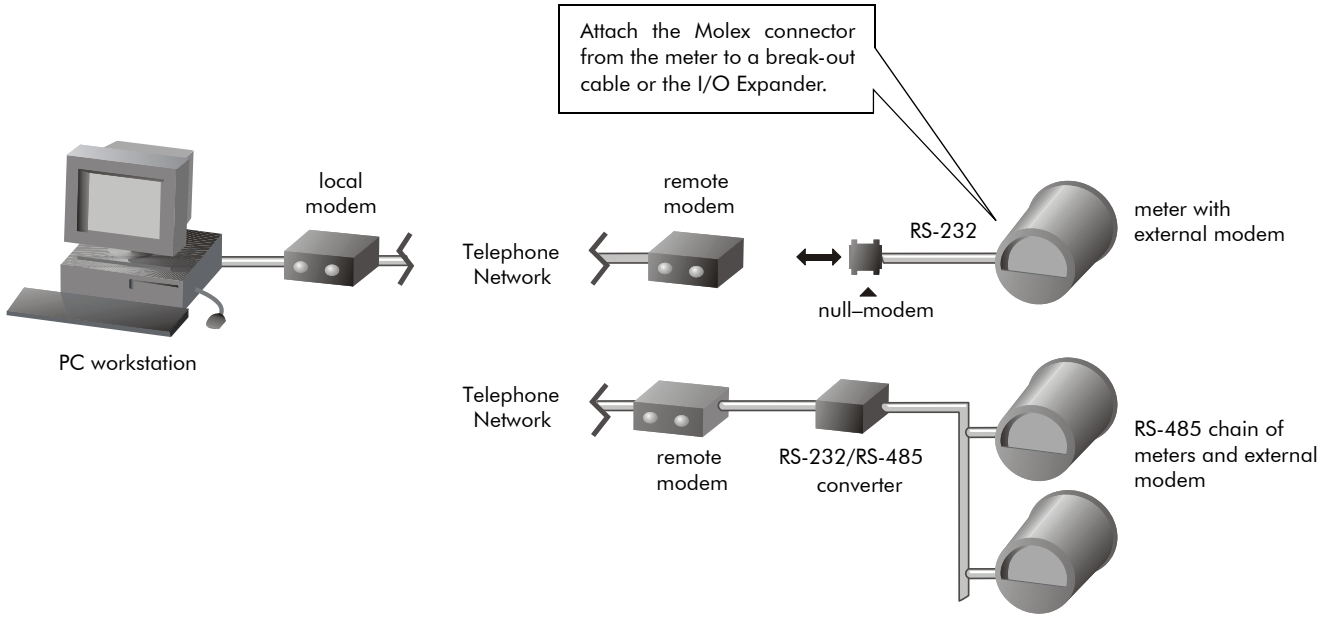
Serial Connections

If the meter's COM1 port is set to RS-232, you can connect this port to a remote modem, which in turn is connected to a PC. You must use a null-modem RS-232 cable to connect the meter to an external modem. One end of the cable must be equipped with a Micro-Fit 3.0 Molex female connector for mating with the Molex male connector on the meter.

You can chain numerous meters' COM1 ports, by selecting 'RS-485' and using an RS-232 to RS-485 converter (such as COM32 or COM128).

NOTE

You cannot use both RS-232 and RS-485 ports on the meter's COM1 simultaneously.



If your meter is part of an ION Enterprise power-monitoring network, you can configure your local and remote modems with ION software. You can also use ION software to schedule regular connection times to collect meter data.

Extension Molex cables with a female Molex connectors are available from your supplier. Maximum overall cable length is 50 feet (15.2 m). Pin assignments for the Molex connector are provided in the *ION8600 Installation Guide* that ships with the meter (also available at www.powerlogic.com).

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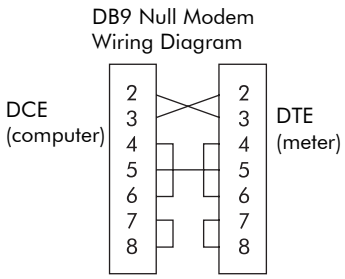
RS-232 Connections

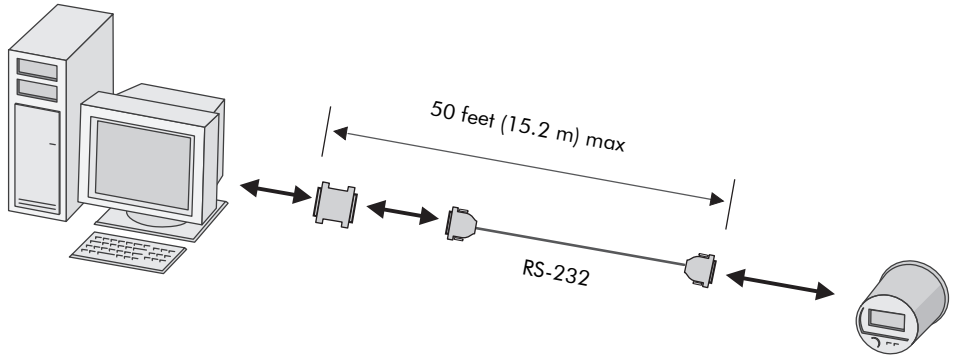
Refer to *ION8600 Installation Guide* for the meter's RS-232 specifications.

Because of the wiring configuration between pins 2 and 3, the meter is considered a DTE (Data Terminal Equipment) device in all RS-232 connections. In order to communicate directly to a PC you must use a null modem cable or the optional break-out cable to mate the pinouts on the PC with the meter. The maximum cable length is 50 feet (15.2 m).

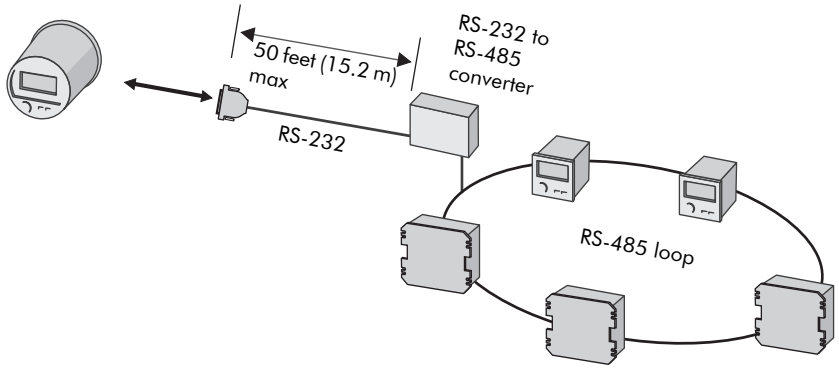


Communications settings for the RS-232 port are accessible through the front panel Setup menu (see Chapter 2 - "Using the Front Panel") and with ION software.

Computer Connections



Meter Connections



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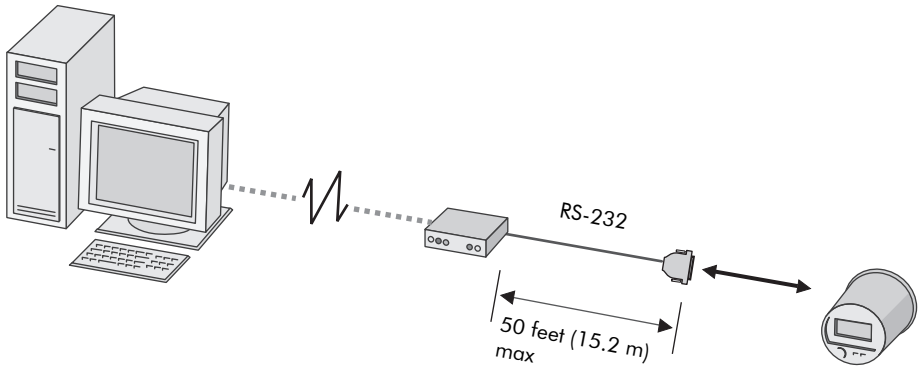
External Modem Connections



RS-485 Connections

Refer to the *ION8600 Installation Guide* for RS-485 specifications.

If you have not installed the I/O Expander or the communications break-out cable, a custom cable is required to connect the D+ and D- pins from the male Molex connector to the RS-485 data bus. The I/O Expander box is wired as a DTE device and requires a NULL modem cable/adapter to connect to the serial port.

The break-out cable's twisted pair provide connections for both of the meter's RS-485 serial communications ports. The first set is for COM1 RS-485 connections. The second set is for COM4 RS-485 communications.

Up to 32 devices can be connected on a single RS-485 bus. Use a good quality shielded twisted pair cable for each RS-485 bus, AWG 22 (0.33 mm^2) or larger. The overall length of the RS-485 cable connecting all devices cannot exceed 4000 feet (1219 m). The RS-485 bus may be configured in straight-line or loop topologies.

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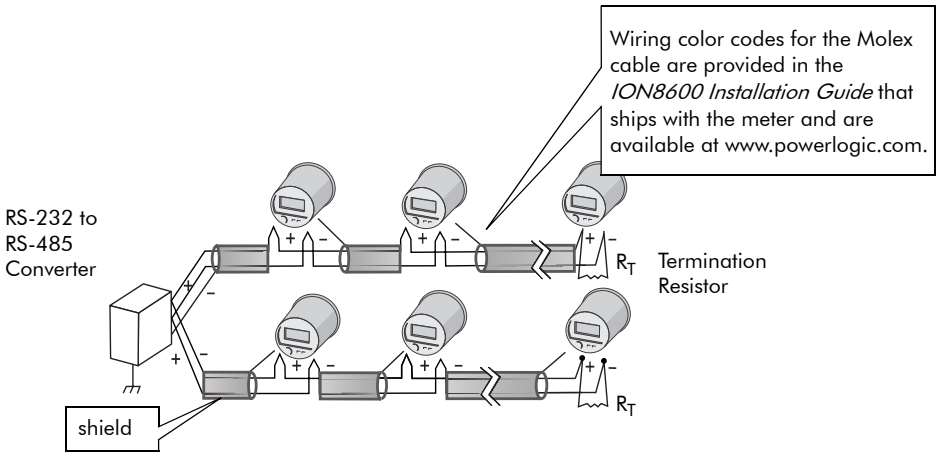
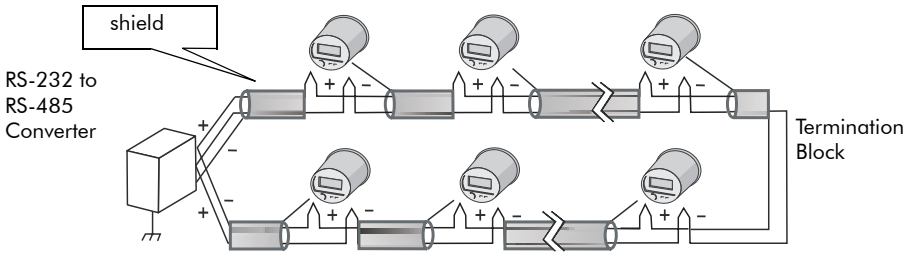
Straight-Line Topology


Wiring color codes for the Molex cable are provided in the *ION8600 Installation Guide* that ships with the meter and are available at www.powerlogic.com.
RS-232 to RS-485 Converter
R_T
Termination Resistor
R_T
shield

Loop Topology



General Bus Wiring Considerations

Devices connected on the bus, including the meter, converter(s) and other instrumentation, must be wired as follows:

- Connect the shield of each segment of the cable to ground at *one end only.*
- Isolate cables as much as possible from sources of electrical noise.
- Use an intermediate terminal strip to connect each device to the bus. This allows for easy removal of a device for servicing if necessary.
- Install a ¼ Watt termination resistor (**RT**) between the (+) and (-) terminals of the device at each end point of a straight-line bus. The resistor should match the nominal impedance of the RS-485 cable (typically 120 ohms – consult the manufacturer's documentation for the cable's impedance value).

RS-485 Connection Methods to Avoid

Any device connection that causes a branch in the main RS-485 bus should be avoided. This includes *star* and *tee (T)* methods. These wiring methods can cause signal reflections that may lead to interference. At any connection point on the RS-485 bus, no more than two cables should be connected. This includes connection points on instruments, converters, and terminal strips. Following this guideline ensures that both star and tee connections are avoided.

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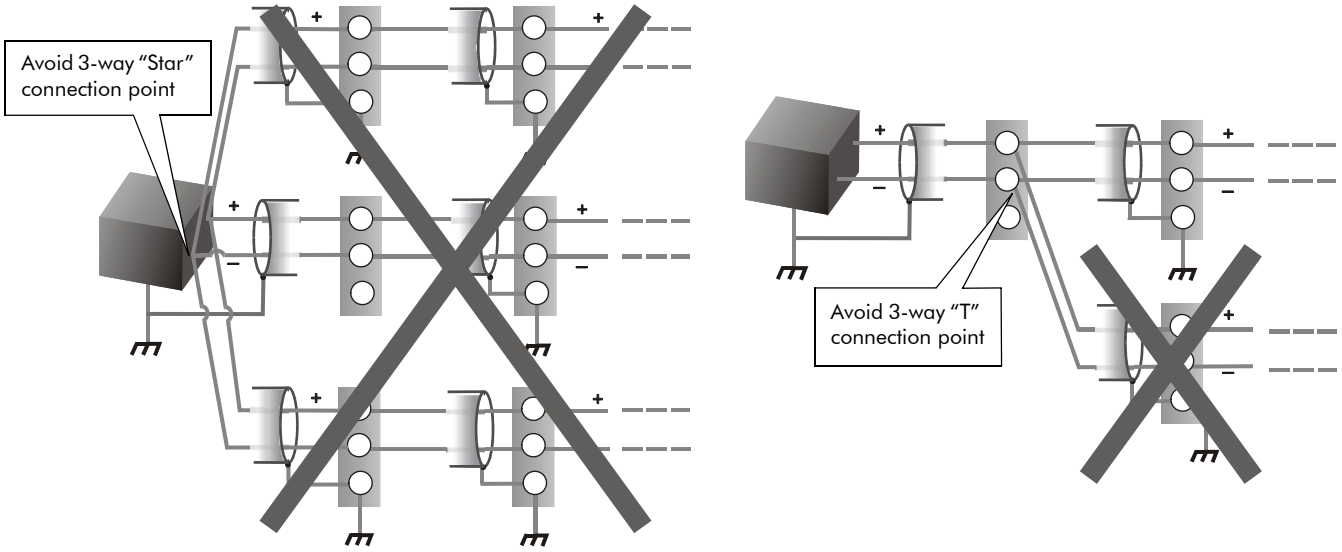
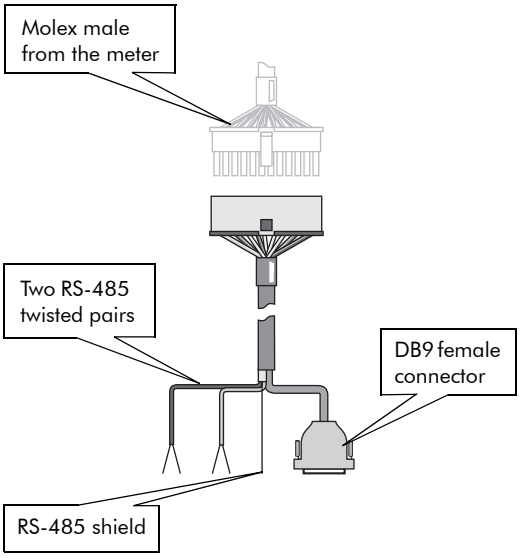


Communications Break-out Cable

Refer to the *ION8600 Installation Guide* for the DB9 serial pin assignments for the optional break-out cable female DB9 connector. A communications break-out cable facilitates communications connections by connecting to the Molex male connector on your meter. The cable splits to a standard DB9 female connector and two RS-485 shielded, twisted pairs. Cable length is 152 cm (5 feet).



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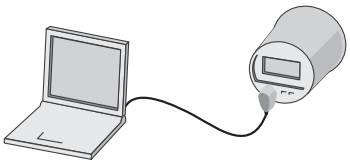
Configuring the Optical Port



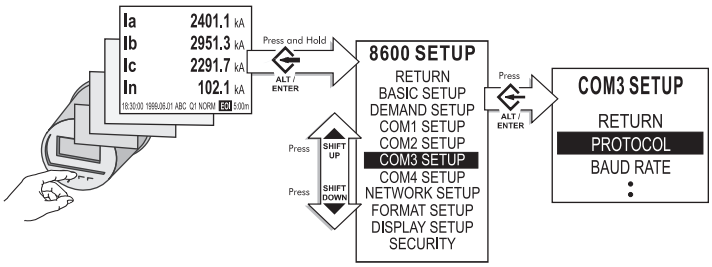
Refer to the *ION8600 Installation Guide* for infrared port specifications.

The infrared port available on the ION8600 meters is compatible with standard magnetic optical communications couplers, or optical probes (ANSI Type II). Optical probes are available both from Schneider Electric and other suppliers as a separate product; contact Schneider Electric for a list of suppliers. The original equipment manufacturer's warranty will apply. See the technical note *Optical Magnetic Couplers* for more detailed information.

Optical probes can communicate real-time measurements via the ION, Modbus RTU, DNP 3.0, Factory, or GPS protocols. You can configure the optical port communications settings with the front panel, with ION Setup, or with the Designer component of ION Enterprise.

Using the front panel

1. Press and hold the **Alt/Enter** button for a few seconds. The SETUP MENU will appear.
2. Use the Up or Down arrow buttons to choose COM3 SETUP.
3. Press the **Alt/Enter** button to access COM3 SETUP parameters.
4. Configure the COM3 *Baud Rate*, *Unit ID*, and *Protocol* parameters to match your communications system.



Using ION Setup

1. Run ION Setup and connect to the appropriate meter.
2. Double-click on "Setup Assistant" in the right side of the Network Viewer.
3. In the Setup screens, navigate to Communications > Serial Settings.
4. Click the COM3 tab and configure the *Baud Rate*, *Unit ID*, and *Protocol* parameters to match your communications system.

To enable communications from the infrared port, you must configure the COM3 Communications module. The *Protocol*, the *Baud Rate* and *Unit ID* setup registers must properly match your system. When creating an ION site, ensure the RtsCts is disabled (set to No) in the COM3 serial site.

Refer to the Management Console section of the online ION Enterprise Help for more details about adding serial sites.

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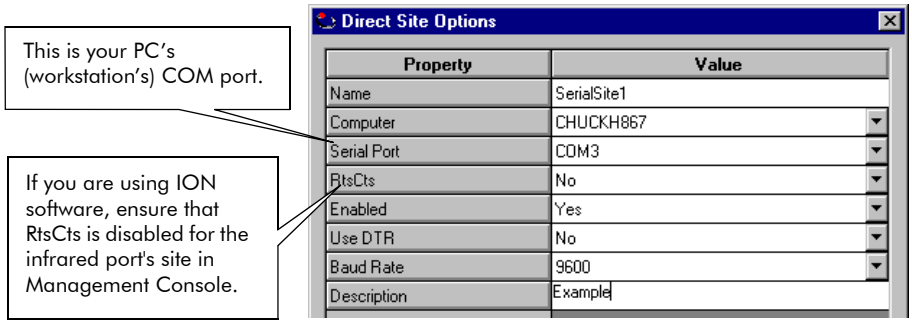
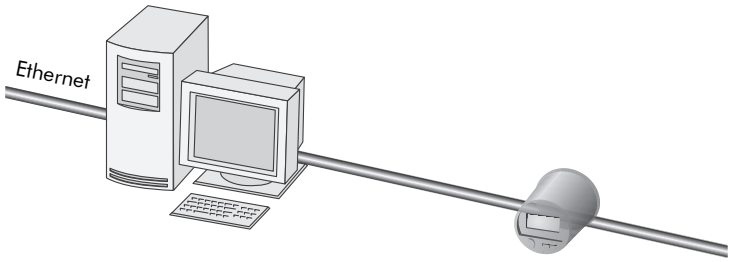
Using ION Enterprise

1. From the Management Console, select (or create) a "direct site" from the management console.
2. Configure the COM3 communications module (refer to the online ION Enterprise help for details). Ensure the *Protocol*, the *Baud Rate*, and *Unit ID* setup registers properly match your system.



Configuring Ethernet Connections

This section only applies if your meter has an Ethernet option. Refer to the *ION8600 Installation Guide* for Ethernet port specifications.



Ethernet connections are made via the RJ45 modular jack on the rear of the unit (10Base-T option) or via two male ST connectors (fibre 10Base-FL option). Use high quality Category 3, 4 or 5 UTP cable (RJ45 female to RJ45 male) if you require an extension. The optional Ethernet port is capable of data rates up to 10 Mbps, and supports TCP/IP, ION, Telnet, and Modbus/TCP protocols. The Ethernet port is controlled by the ETH1 Communications module.

The EtherGate feature provides communications both to an Ethernet connected device and through that device to a connected serial network (See "Configuring EtherGate Connections" on page 85).

You can configure the Ethernet Communications module to enable Ethernet communications using the front panel, ION Setup or ION Enterprise. In each case, you must configure the *IP Address*, *Subnet Mask*, *Gateway*, *SMTP Server* and *SMTP Connection Timeout* to properly match your system.

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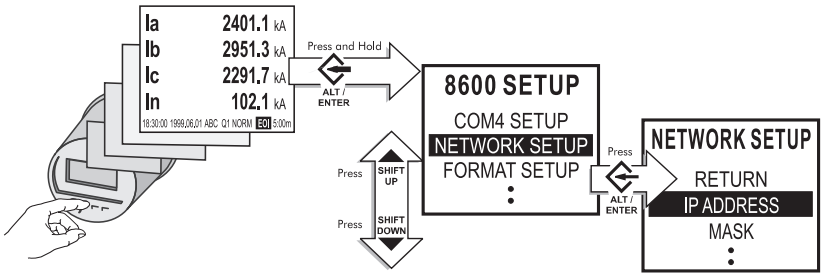
Using the front panel

1. Select NETWORK SETUP from the main Setup menu (hold down the **Alt/Enter** key for about 3 seconds and scroll down using the softkeys).



2. Configure the Ethernet Communications module *IP Address*, *Subnet Mask, Gateway, SMTP Server* and *SMTP Connection Timeout* setup registers to match your communications system.

Using ION Setup

Once you have wired your meter to the Ethernet network and performed basic setup, add the meter to your ION Setup networking using the Setup Assistant.

1. Run ION Setup and connect to the appropriate meter.
2. Double-click on "Setup Assistant" in the right side of the Network Viewer.
3. In the Setup screens, navigate to Communications > Network Settings.
4. Click the various tabs to configure the *IP Address*, *Subnet Mask, Gateway, SMTP Server* and *SMTP Connection Timeout* setup registers to match your communications system.

Using ION Enterprise

After you have wired your meter to the Ethernet network and performed basic setup, add the meter to your ION Enterprise network using the Management Console. It is not necessary to add an Ethernet site.

To enable communications through the Ethernet port, you must configure the Ethernet (Communications) module. Launch Designer and configure the *IP Address*, *Subnet Mask, Gateway, SMTP Server* and *SMTP Connection Timeout* registers to match your system.

Adding an Ethernet device to your ION Enterprise Network

In the Management Console, the Ethernet Device Options screen appears when you add an Ethernet device (meter). Use this screen to describe your meter Ethernet address and other communications information. Be sure to include:

- the server computer that communicates with the Ethernet device

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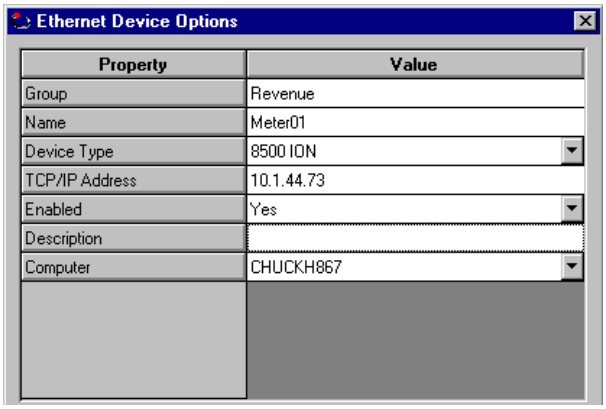
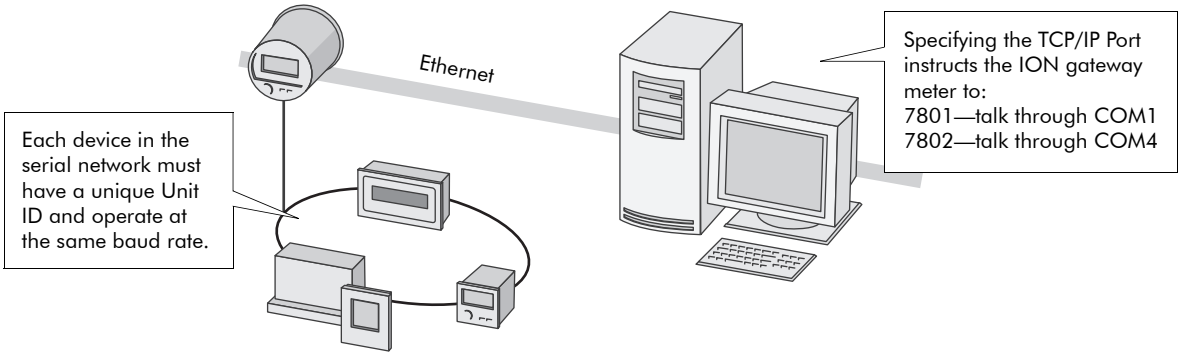
- the Ethernet device TCP/IP address



Configuring EtherGate Connections

The EtherGate protocol is a powerful communications tool that lets you communicate *to* a meter and *through* a meter simultaneously. When a meter installed on the Ethernet network has EtherGate enabled, a master device (such as a workstation running ION Enterprise software) can communicate *to* the meter, and *through* the meter to a serial network of devices wired to the meter's COM port. EtherGate is available on serial ports COM1 and COM4 in place of the ION, Modbus Master, Modbus RTU, or DNP 3.00 protocols. The protocol permits the direct transfer of data from up to 62 devices (31 devices per COM port).


Ethernet
Each device in the serial network must have a unique Unit ID and operate at the same baud rate.
Specifying the TCP/IP Port instructs the ION gateway meter to:
7801—talk through COM1
7802—talk through COM4

Once you have the chain of serial devices installed, use Designer or the meter's front panel to change the COM1 or COM4 *Protocol* setting to **EtherGate**. The transfer of data between protocols is then handled automatically.

Using the front panel

1. Press and hold the **Alt/Enter** button for a few seconds to reach the Setup screens.
2. Press the **Up** or **Down** arrow buttons to scroll to COM1 Setup (or COM4, depending on your meter's options). Press **Alt/Enter** to go to the COM1 Setup parameters.

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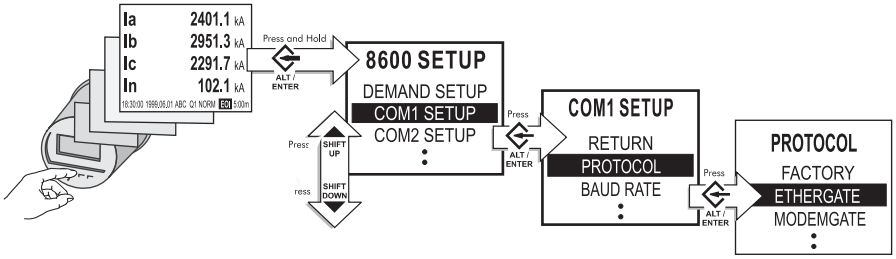
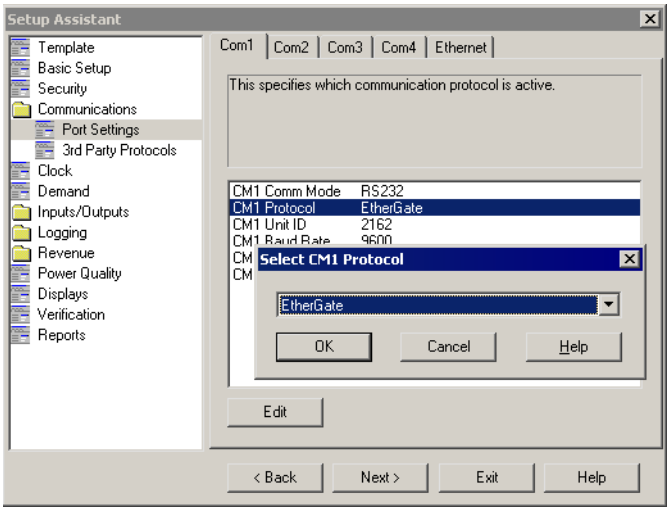
3. Scroll to Protocol and press **Alt/Enter**. Change the port's *Protocol* setting to **EtherGate** using the Up or Down arrow buttons.



Using ION Setup

1. Run ION Setup and connect to the appropriate meter.
2. Double-click on "Setup Assistant" in the right side of the Network Viewer.
3. In the Setup screens, navigate to Communications > Port Settings and click the **COM1** tab.
4. Select Protocol, click **Edit** and select **EtherGate**.



Refer to *The ION Meter as an Ethernet Gateway* technical note for complete details on configuring your meter for EtherGate.

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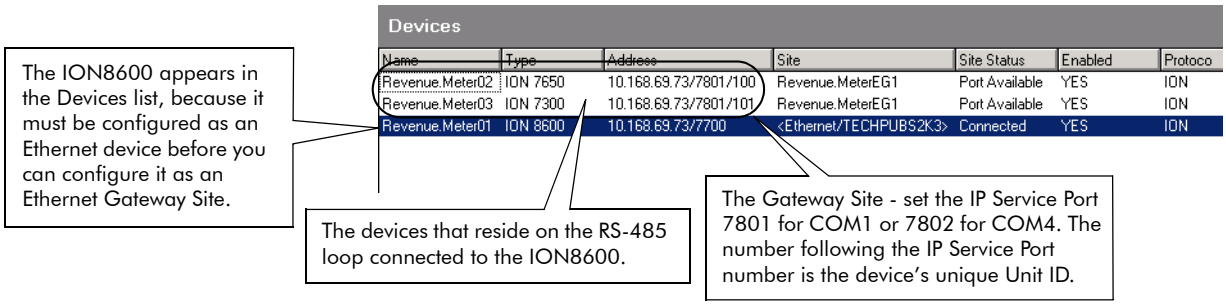
Using ION Enterprise

1. To communicate to the devices on the RS-485 loop, you must use ION Enterprise software. Use the Management Console to create a Gateway Site.
2. Once you have created a Gateway Site add each of the devices on the RS-485 loop to it (but not the gateway meter itself).
3. When configuring the Gateway Site, enter the *IP Address* of the meter and the *IP Service Port* to match the COM port you are using:
   - **7801** = EtherGate IP service port on COM1
   - **7802 =** EtherGate IP service port on COM4

The Devices list in the Management Console appears as follows:



NOTE

In the above configuration you communicate with the devices in the RS-485 loop *through* the meter. You must add the meter to an additional Ethernet Site to communicate directly to the meter.

Communicating directly TO the meter

In order to connect directly over Ethernet, enter the meter's IP address when prompted by the software.

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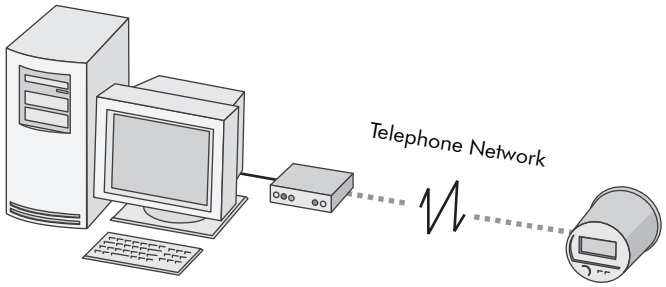
Internal Modem Connections

This section only applies if your meter has the internal modem option. Refer to the *ION8600 Installation Guide* for internal modem specifications.



The internal modem is accessed through COM2 and supports all standard modem protocols at transmission rates from 300 bps to 57600 bps (300 bps is only recommended for paging applications) and can be shared by up to 31 devices on an RS-485 chain. It is available with a standard six-pin RJ-11 phone plug, or an eight-pin RJ-31. If you have multiple meters linked on an RS-485 loop, only the first meter requires an internal modem. This setup is referred to as a ModemGate (see "The ModemGate Protocol" on page 91).You can configure the settings of the internal modem with the front panel or with ION software.

To enable communications through the meter's internal modem, configure the COM2 communications module *Baud Rate*, *Unit ID*, and *Protocol* setup registers to properly match your system, and setup the initialization string for the internal modem must be using the *ModemInit* register.

NOTE

When the meter is equipped with the ION Alert module, the modem can initiate calls. Paging is supported through numeric paging and the TAP1 protocol. See the *ION Enterprise Administrator's Guide* for details on managing modem connections, setting up periodic dial-out and configuring remote site event notification.

ModemInit Setup Register

The *ModemInit* string register defines the initialization string for the internal modem with a maximum of 47 characters. Edit the *ModemInit* register and enter the desired initialization string. The string is sent to the modem as soon as you download the COM1 module. Note that the string is also sent to the modem whenever the meter is powered up or the baud rate in the COM1 Communications module is changed. Any changes to the *Modem Init* or *Baud Rate* setup registers while the modem is online causes the modem to disconnect from the phone line.

CAUTION

Changing the *ModemInit* setup register while the internal modem is online causes the modem to disconnect from the phone line.

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Modem Initialization Strings

Refer to the *Modem AT Commands* technical note for a complete list of AT commands for meter modems.

NOTE

The technical note also contains instructions on how you can determine your meter's modem type based on the meter's serial number.

Adjusting the Modem Initialization String for CTR-21 Compliant modems

The table below shows the strings to add to the end of your modem configuration string setup register for each of three possible problems.

Problem	Add to Modem Initialization String
Does not answer (modem does not detect ring tone)	*NC70
Does not dial (modem does not detect dial tone)	In order of preference: *NC70, *NC70X0, *NC8 (Italy only)
Does not detect busy signal	*NC70

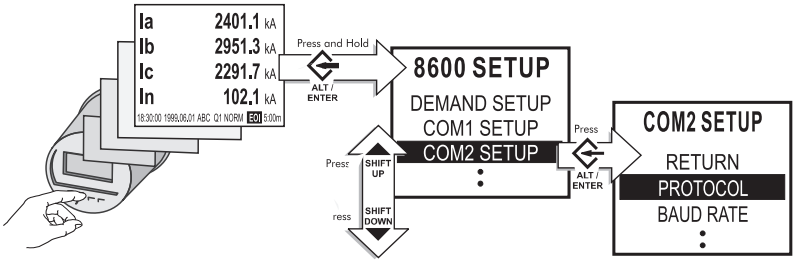
If your *local* modem (not the internal modem) is not already set up, configure it with the Remote Modem Configuration Utility according to the instructions in the online help. After the meter is installed and the internal modem is connected to the telephone network, the COM2 module can be configured using the meter's front panel or ION software. To learn how to connect the internal modem to the telephone network, consult your *ION8600 Installation Guide*.

NOTE

The *ION Enterprise Commissioning Guide* contains details on: commissioning an ION network, managing modem connections, setting up periodic dial-out, and configuring remote site event notification.

Configuring the COM2 module through the front panel

1. Press and hold the Alt/Enter button and scroll to COM2 Setup.
2. Select COM2 Setup to configure the COM2 communications module *Baud Rate, Unit ID,* and *Protocol* setup registers to your communications system.



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Configuring the COM2 module via Designer

Before you can configure the COM2 module in Designer you must add the meter (with the internal modem) and a modem site to your ION Enterprise network.

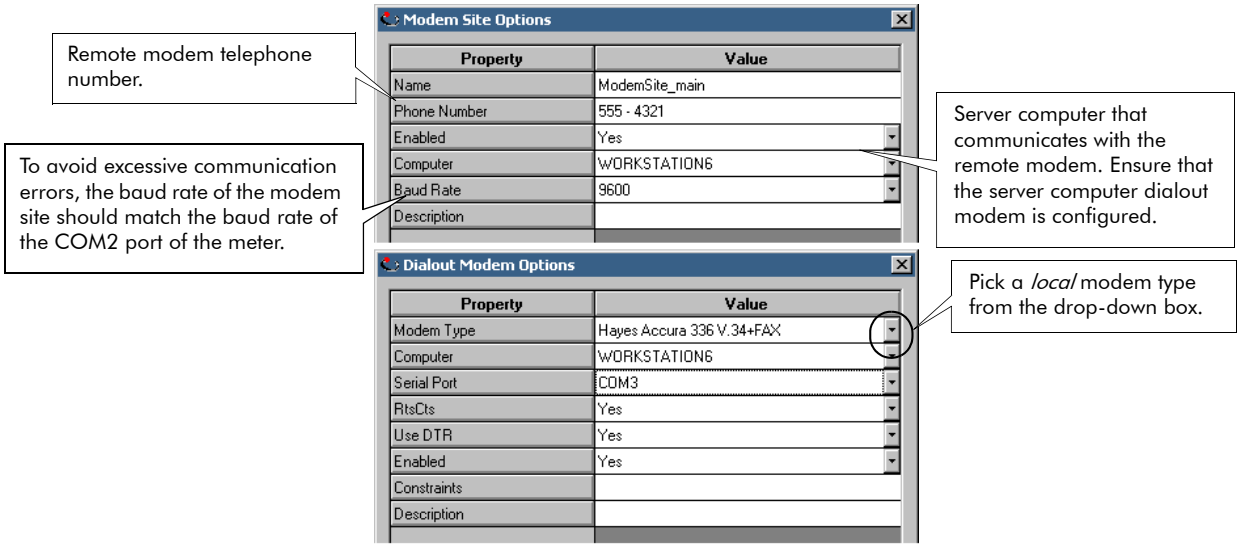
Adding a meter and a modem site to your ION Enterprise network

In the Management Console, add the meter with the internal modem, and a modem site to your ION Enterprise network. Describe how your remote modem is wired and other communications information on the options screens.

Either before or after adding the Modem Site, you must add a dialout modem to the server computer. The server computer dialout modem communicates to the modem at the modem site. See the *ION Enterprise Commissioning Guide* for more information.

On the Modem Site Options screen, be sure to include:

- the server computer that will communicate with the remote modem
- the remote modem telephone number



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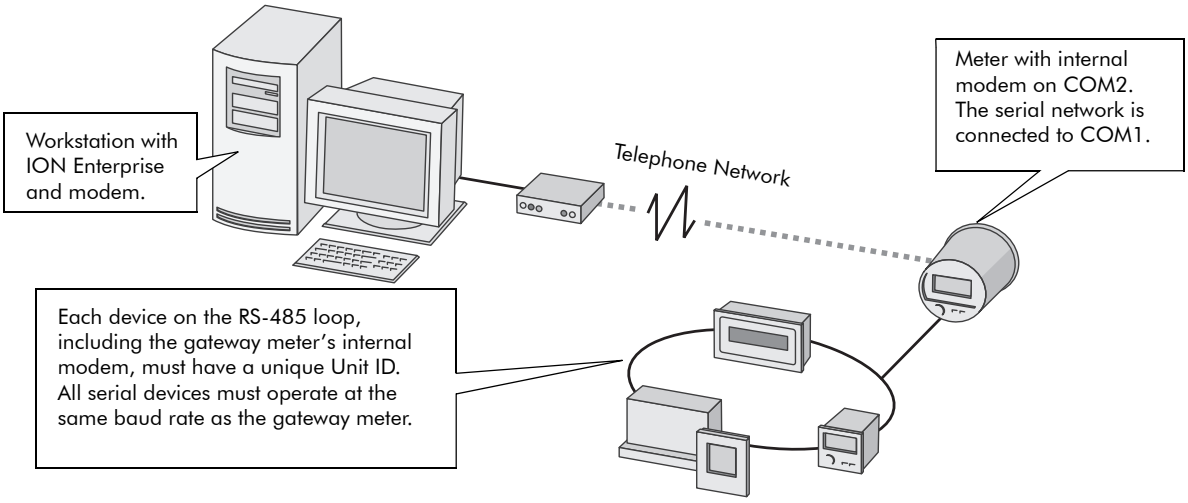
Configuring the COM2 Communications module in Designer

Launch Designer, and configure the COM2 Communications module *Baud Rate, Unit ID,* and *Protocol* setup registers to match your communications system. Configure the initialization string for the internal modem using the *ModemInit* register. Refer to "ModemInit Setup Register" on page 88.

The ModemGate Protocol

ModemGate is a powerful feature that creates a communications connection between the telephone network and an RS-485 serial network of devices. When you specify the protocol for a meter's COM port as MODEMGATE, all data received by the meter's internal modem is automatically transferred to the serial network. ModemGate is available on either the COM1 or COM4 port; you cannot use the protocol on both ports simultaneously.


Workstation with ION Enterprise and modem.
Telephone Network
Meter with internal modem on COM2. The serial network is connected to COM1.
Each device on the RS-485 loop, including the gateway meter's internal modem, must have a unique Unit ID. All serial devices must operate at the same baud rate as the gateway meter.

The baud rate used between connected modems is independent of the internal baud rate used for communication between the meter and its modem.

Wire a serial connection between one or more meters and the meter COM port hosting the ModemGate (COM1 or COM4). You can make ModemGate connections through an RS-232 cable to a single device, or through an RS-485 shielded twisted pair cable to multiple devices. ModemGate connections do not connect a workstation running ION Enterprise (or other master device) to the gateway meter's COM1 or COM4 port, but rather to the gateway meter's internal modem port (COM2).

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Configuring the meter for ModemGate

1. Install the meter and connect the internal modem.
2. Use the front panel or ION software to set up the internal modem and the serial communications port (COM1 or COM4) that is the ModemGate. The default for these ports is:

Communications modules	Setting	Default
COM1 (Standard RS-232/485 port)	Comm Mode	RS-485
	Baud Rate	9600
	Unit ID	100
	Protocol	ION
COM2 (Modem Port)	Baud Rate	9600
	Unit ID	101
	Protocol	ION
	Modem Init Strings	AT&F
COM4 (RS-485 port)	Baud Rate	9600
	Unit ID	103
	Protocol	ION

NOTE

You can enable ModemGate on either COM1 or COM4, not both simultaneously.

3. Set the internal modem COM2 *Baud Rate, Unit ID* and *Protocol*. The baud rate must be the same as the port hosting the gateway and all the devices connected to the gateway.
4. Set the protocol of the port hosting the gateway to MODEMGATE (either COM1 or COM4). You must also set the baud rate to the same as the modem baud rate (COM2).

Configuring devices connected to the ModemGate meter

1. Use ION software or the front panel to change and configure settings. Ensure each device connected to the meter has the same baud rate as the meter ModemGate port (either COM1 or COM4).
2. Ensure each device connected on the RS-485 network (including the meter modem) has a unique Unit ID number. Make a record of your changes.

NOTE

In order to configure the dial-in connection the system administrator requires the serial baud rate of the modem site and a record of the Unit ID numbers for every device.

3. Ensure 'RS-485' is selected for connections to multiple devices along the same bus.

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Adding ModemGate meters to the network

1. Once you have created a Modem Site using the Management Console, add the meter and all devices connected to the ModemGate port.
2. Ensure each meter on the modem Site has a unique Unit ID number (the technician who installed the meter at the remote site should provide you with this information).

Refer to the *ION Meter as a ModemGate* technical note for complete details on configuring your meter for ModemGate.

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Chapter
7

Third Party Protocols

This chapter explains how Modbus and DNP 3.0 protocols are implemented on the ION8600 meter.

It also contains brief instructions for configuring your meter to work with MV90 systems.

In this chapter

- **Overview** **96**
  - Communications Protocol Configuration 96
- **The Meter as Modbus Slave** **97**
  - Using the Modbus RTU Protocol 97
  - Modbus Slave Modules 98
  - Using the Modbus/TCP Protocol 104
- **The Meter as Modbus Master** **105**
- **Configuring Modbus** **106**
- **Using the DNP 3.0 Protocol** **108**
  - Configuring DNP 3.0 108
- **Configuring MV90** **110**

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Overview

ION8600 meters support DNP 3.0, Modbus RTU and Modbus/TCP protocols.

While your meter is factory configured to **send** data (acting as Modbus Slave), it is not ready to **receive** data as a Modbus Master until you set up the necessary framework. The meter is also pre-configured to **send** DNP 3.0 data to a DNP Master.

NOTE

Changing the default factory third-party protocol frameworks (or creating new frameworks to enable receive functionality) is an advanced procedure. Refer to the DNP modules and Modbus modules descriptions in the *ION Reference*, as well as the technical notes *Multiport DNP 3.0 and ION Technology,* and *Modbus and ION Technology* before proceeding.

Most Modbus and DNP modules on the meter are factory pre-set and only require basic configuration, such as communications setup.

NOTE

Changing these modules from their factory configuration is an advanced setup procedure that requires an understanding of the protocol, as well as an understanding of the meter's internal operation. For more information on your meter and these protocols see the *Common Modbus Registers* document and the *ION8600 DNP 3.0 Device Profile*.

Communications Protocol Configuration

In order to use the factory Modbus or DNP configuration, you must first assign the communications channel you want to use. By default, all communications ports are configured to use the ION protocol. Choose the 3rd-party protocol you want from the list of available protocols in the Communications module's Protocol setup register. See the chapter "Communications" on page 73 for instructions.

NOTE

Modbus RTU is available on each of the meter's communications ports, and multiple ports can communicate using Modbus simultaneously. Up to three ports can use the DNP 3.00 protocol at any one time.

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The Meter as Modbus Slave

Your meter can act as a Modbus Slave, using both the Modbus RTU and Modbus/TCP protocols.

Using the Modbus RTU Protocol

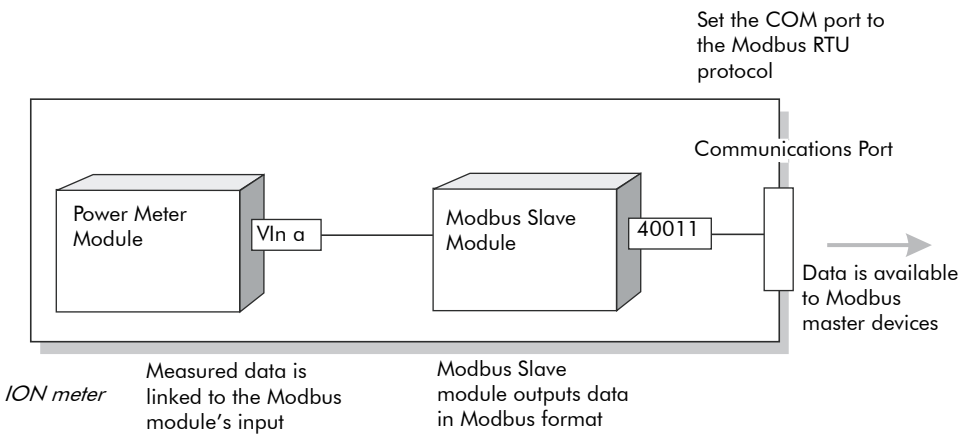
The ION8600 meter can act as a Modbus Slave device, making any real-time data available through the Modicon Modbus RTU protocol. Modbus Master devices connected to the meter can access (read) this data or write data to your meter's ION registers, making device configuration changes and initiating control actions.

The Factory Modbus Slave Configuration

The meter makes data available to Modbus Master devices using pre-configured Modbus Slave modules. These modules are linked to other modules in the meter that provide the energy, power and demand data. Once a communications channel is configured to use Modbus RTU protocol, the data is available to Modbus Master devices.

NOTE

Connect to IP Service Port 7701 for Modbus RTU communications over Ethernet. The Modbus Unit ID of the meter over Ethernet is 100.


Set the COM port to the Modbus RTU protocol
Communications Port
Power Meter Module
VIn a
Modbus Slave Module
40011
Data is available to Modbus master devices
ION meter
Measured data is linked to the Modbus module's input
Modbus Slave module outputs data in Modbus format

As the data available through the Modbus Slave modules is in a specific format, knowledge of the Modbus protocol and an understanding of the settings used in the meter are required to interpret the data provided.

Changing the Modbus Configuration

If the factory Modbus configuration does not suit your needs, the existing Modbus Slave modules can be relinked to other parameters that you want to access through Modbus.

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If your Modbus Master device requires data in a format different than that provided by the factory Modbus configuration, you can edit the setup registers in the Modbus Slave modules. These setup registers specify the Modbus format, scaling and base address settings. Refer to the *ION Reference* for complete details on the Modbus Slave module.

Modbus Slave Modules

The ION8600 meter has ten Modbus slave modules. Modules 1 - 5 are part of the original modbus mapping and are preserved for backward compatibility. If you are using the new Modbus mapping (modules 6 - 10), you can delete modules 1 - 5.

#	Modbus Slave Module (original mapping)	#	Modbus Slave Module (new mapping)
1	Volts/Amps/Freq	6	Amp/freq/unbal
2	Power/PF	7	Volts
3	Min/Max/Demand	8	kW/kVAr/kVA
4	Energy/THD	9	kWh/kVArh
5	Flicker Count	10	PF/THD/Kfactor

The settings for your Modbus Slave modules follow.

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Amp/Freq/Unbal

Format:	unsigned 16 bit	InZero:	0
Base Address:	40150	InFull:	6,000
Scaling:	Yes	OutZero:	0
		OutFull:	60,000

Input	Modbus Registers	Parameter
Source #1	40150	Ia
Source #2	40151	Ib
Source #3	40152	Ic
Source #4	40153	I4
Source #5	40154	I5
Source #6	40155	I avg
Source #7	40156	I avg mn
Source #8	40157	I avg mx
Source #9	40158	I avg mean
Source #10	40159	Freq
Source #11	40160	Freq mn
Source #12	40161	Freq mx
Source #13	40162	Freq mean
Source #14	40163	V unbal
Source #15	40164	I unbal
Source #16	40165	Phase Rev

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Volts

Format:	unsigned 32 bit	InZero:	0
Base Address:	40166	InFull:	1,000,000
Scaling:	No	OutZero:	0
		OutFull:	10,000,000

Input	Modbus Registers	Parameter
Source #1	40166 to 40167	Vln a
Source #2	40168 to 40169	Vln b
Source #3	40170 to 40171	Vln c
Source #4	40172 to 40173	Vln avg
Source #5	40174 to 40175	Vln avg mx
Source #6	40176 to 40177	
Source #7	40178 to 40179	Vll ab
Source #8	40180 to 40181	Vll bc
Source #9	40182 to 40183	Vll ca
Source #10	40184 to 40185	Vll avg
Source #11	40186 to 40187	Vll avg mx
Source #12	40188 to 40189	Vll avg mean
Source #13	40190 to 40191	
Source #14	40192 to 40193	
Source #15	40194 to 40195	
Source #16	40196 to 40197	

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kW/kVAr/kVA

Format:	signed 32 bit	InZero:	-1,000,000,000
Base Address:	40198	InFull:	1,000,000,000
Scaling:	No	OutZero:	-1,000,000
		OutFull:	1,000,000

Input	Modbus Registers	Parameter
Source #1	40198 to 40199	kW a
Source #2	40200 to 40201	kW b
Source #3	40202 to 40203	kW c
Source #4	40204 to 40205	kW tot
Source #5	40206 to 40207	kW tot max
Source #6	40208 to 40209	kVAR a
Source #7	40210 to 40211	kVAR b
Source #8	40212 to 40213	kVAR c
Source #9	40214 to 40215	kVAR tot
Source #10	40216 to 40217	kVAR tot max
Source #11	40218 to 40219	kVA a
Source #12	40220 to 40221	kVA b
Source #13	40222 to 40223	kVA c
Source #14	40224 to 40225	kVA tot
Source #15	40226 to 40227	kVA tot max
Source #16	40228 to 40229	

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kWh/kVArh

Format:	signed 32 bit	InZero:	-1,000,000,000
Base Address:	40230	InFull:	1,000,000,000
Scaling:	No	OutZero:	-1,000,000
		OutFull:	1,000,000

Input	Modbus Registers	Parameter
Source #1	40230 to 40231	kWh del
Source #2	40232 to 40233	kWh rec
Source #3	40234 to 40235	kVARh del
Source #4	40236 to 40237	kVARh rec
Source #5	40238 to 40239	kVAh del+rec
Source #6	40240 to 40241	
Source #7	40242 to 40243	
Source #8	40244 to 40245	
Source #9	40246 to 40247	
Source #10	40248 to 40249	
Source #11	40250 to 40251	
Source #12	40252 to 40253	
Source #13	40254 to 40255	
Source #14	40256 to 40257	
Source #15	40258 to 40259	
Source #16	40260 to 40261	

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PF/THD/Kfactor

Format:	signed 16 bit	InZero:	-100
Base Address:	40262	InFull:	100
Scaling:	No	OutZero:	-10,000
		OutFull:	10,000

Input	Modbus Registers	Parameter
Source #1	40262	PF sign a
Source #2	40263	PF sign b
Source #3	40264	PF sign c
Source #4	40265	PF sign tot
Source #5	40266	V1 THD mx
Source #6	40267	V2 THD mx
Source #7	40268	V3 THD mx
Source #8	40269	I1 THD mx
Source #9	40270	I2 THD mx
Source #10	40271	I3 THD mx
Source #11	40272	I1 K Factor
Source #12	40273	I2 K Factor
Source #13	40274	I3 K Factor
Source #14	40275	I1 Crest Factor
Source #15	40276	I2 Crest Factor
Source #16	40277	I3 Crest Factor

Importing Data using Modbus RTU

It is possible to bring data into the meter using Modbus. Various ION registers can be written by Modbus Master devices by correlating the Modbus register number with the address of the ION register you want to write. When a Modbus register is written with a value, the corresponding ION register will be written, provided the Modbus RTU protocol is active on the communications channel that connects the Modbus Master to the meter.

You can use the Modbus RTU protocol to write values into ION external numeric, pulse and Boolean registers, allowing you to enable, disable and reset meter functions. You can also use the Modbus protocol to change setup register values in various ION modules to configure the meter's operation.

To bring data into the meter with Modbus RTU, you must disable the meter's password security.

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⚠ CAUTION

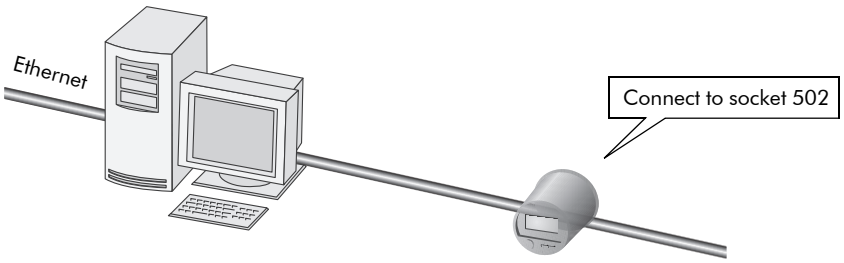
Writing to ION external boolean or external numeric registers via communications at a high rate (faster than once per minute) will cause premature flash memory failure. For possible workarounds, contact Technical Support

Using the Modbus/TCP Protocol

Modbus/TCP is the newest open Modbus protocol variant (formerly called MBAP). It defines the packet structure and connection port (port 502) for the industry standard TCP/IP protocol. The structure of Modbus/TCP is very similar to the Modbus RTU packet except that it has an extra six-byte header and does not use the cyclic redundancy check (CRC). Modbus/TCP retains the Modbus RTU limit of 256 bytes to a packet.

Modbus TCP Communications

You can communicate to the meter using Modbus TCP (formerly called MBAP). Your meter must have the optional Ethernet port. Connect to socket **502**.



NOTE

You cannot form an EtherGate connection to the Modbus TCP network.

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The Meter as Modbus Master

Your meter can act as a Modbus Master using the Modbus RTU and Modbus/TCP protocols.

The ION meter acting as Modbus Master can write data to (export), and read data from (import) Modbus Slave devices, using various ION modules. The data can be processed by the meter and sent out using other communications methods (email, ION software, etc.). The meter can also send control commands or data directly to other devices on a Modbus network.

The Factory Modbus Master Configuration

There is no pre-configured framework for Modbus mastering on your meter. Your meter's template contains Modbus Import modules that can read values and Modbus Export modules that can write data but they must be enabled and configured in a framework first.

See the *Modbus and ION Technology* technical for more information on Modbus Master configuration for your meter.

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Configuring Modbus

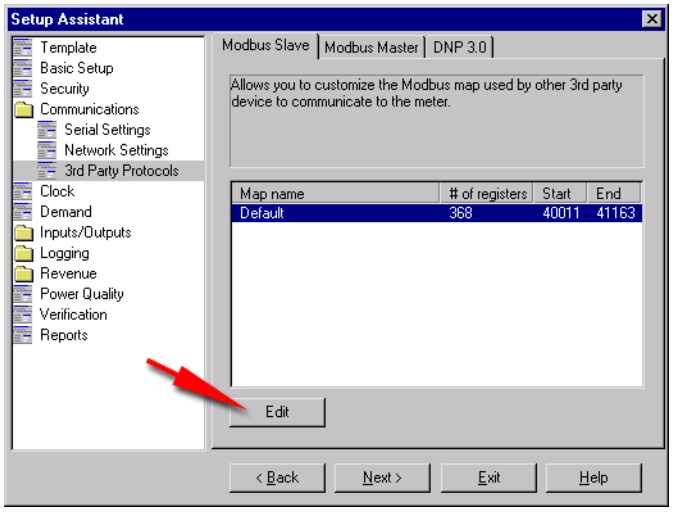
Using the Front Panel

You cannot configure Modbus through the meter's front panel. You can only assign the Modbus protocol to communication ports. See the chapter "Communications" on page 73 for details.

Using ION Setup

The Modbus Setup Assistant helps you configure Modbus Master and Slave functionality for your meter.

1. Open ION Setup and connect to your meter, using Basic Mode.
2. In the Setup Assistant, navigate to Communications > 3rd Party Protocols
3. Click on the Modbus Slave tab to edit the Modbus Slave modules.
4. Select the map name (in this example, the default map) and click **Edit**.



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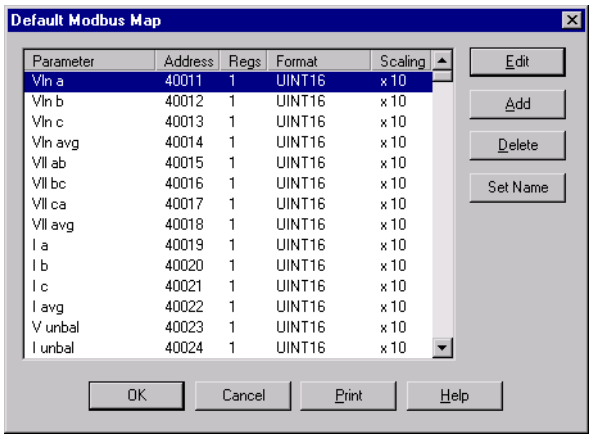
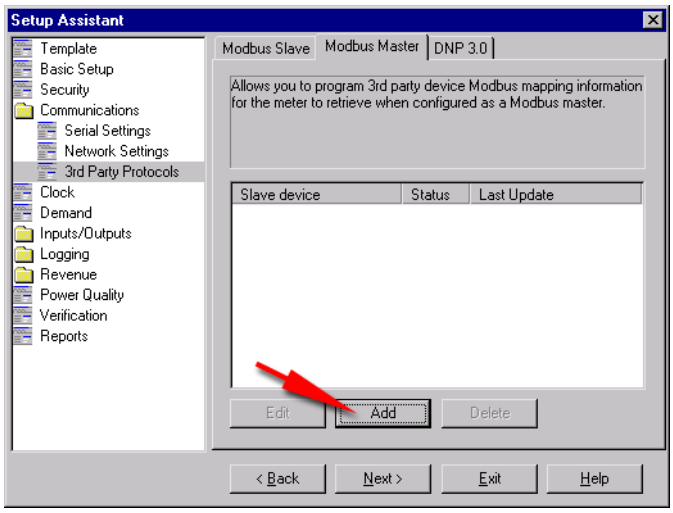
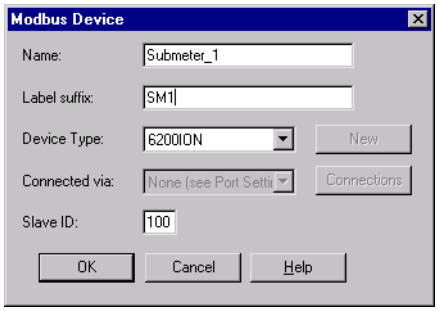
5. The default Modbus map editor appears, allowing you to edit, add, delete or set the name of Modbus Slave module registers.


Default Modbus Map
Parameter
Address
Regs
Format
Scaling
Vln a 40011 1 UINT16 x 10
Vln b 40012 1 UINT16 x 10
Vln c 40013 1 UINT16 x 10
Vln avg 40014 1 UINT16 x 10
Vll ab 40015 1 UINT16 x 10
Vll bc 40016 1 UINT16 x 10
Vll ca 40017 1 UINT16 x 10
Vll avg 40018 1 UINT16 x 10
I a 40019 1 UINT16 x 10
I b 40020 1 UINT16 x 10
I c 40021 1 UINT16 x 10
I avg 40022 1 UINT16 x 10
V unbal 40023 1 UINT16 x 10
I unbal 40024 1 UINT16 x 10
Edit
Add
Delete
Set Name
OK
Cancel
Print
Help

6. Click on the Modbus Master tab to edit the Modbus Import modules.
7. Click the Add button to add a Modbus Slave device.



8. The Modbus Device screen appears. Enter the Slave device's information (in this example, an ION6200) and click **OK** to add.



See the *Modbus and ION Technology* technical note for more information.

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Using the DNP 3.0 Protocol

The Distributed Network Protocol Version 3.0 (DNP 3.0) is an open protocol used in the electric utility industry for communications and interoperability among substation computers, Remote Terminal Units (RTUs), Intelligent Electronic Devices (IEDs, e.g. meters), and Master Stations.

You meter can be integrated into a DNP network as a DNP Slave, using the DNP Slave Import, DNP Slave Export and DNP Slave Options modules. For more information on the various DNP modules, see the *ION Reference*.

Your meter supports a maximum of three concurrent connections (or "sessions") using the DNP 3.0 protocol; one for each serial port, up to three using Ethernet, or a combination of both. Combinations available will depend on the meter's communications options. A session consists of all incoming and outgoing DNP Master/Slave traffic on one of the meter's communications ports.

Consult the DNP User's Group at http://www.dnp.org/ to learn more about the protocol.

The Factory DNP 3.0 Configuration

Your meter is pre-configured with a DNP framework that allows for basic DNP Slave functionality. DNP Slave Export modules are used to send data to the DNP Master while DNP Slave Options modules provide per-session settings such as communications options. Although some minor setup of the framework is necessary before it becomes enabled (assigning the DNP protocol to the communications ports etc.), most module settings should not require alteration.

For information on your meter's default DNP map and factory configuration, see the *ION8600 DNP 3.0 Device Profile*.

Importing Data using DNP 3.0

Data can be imported into the meter from a DNP control relay or analog output device. DNP Slave Import modules are used to take a DNP Analog output or Binary output object and map them into ION registers.

NOTE

DNP Slave Import modules are not part of the factory DNP framework and must be added manually. Refer to the DNP Slave Import module description in the *ION Reference* for details.

Configuring DNP 3.0

If the factory DNP configuration does not suit your needs, you can relink the existing DNP Slave Export modules to access a different set of parameters through DNP. Alternately, you can add additional DNP Slave Export modules and link the desired ION parameters to them.

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If your DNP network requires data in a format different than that provided by the factory DNP configuration, you can edit the setup registers in the DNP Slave Export modules and the DNP Slave Options modules. Do not make any changes to the DNP Slave Options modules' setup registers unless you understand the effects each change will cause. Refer to the *ION Reference* for complete details on DNP Slave Export and DNP Slave Options module function.

For detailed information on configuring your meter to use DNP, see the *Multiport DNP and ION Technology* technical note.

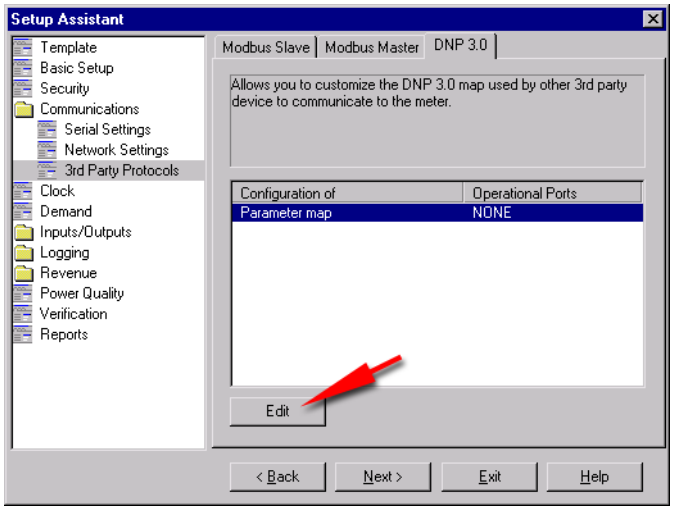
Using the Front Panel

You cannot configure DNP through the meter's front panel. You can only assign the DNP 3.0 protocol to communication ports. See the Communications chapter.

Using ION Setup

The DNP 3.0 Setup Assistant helps you configure the DNP Slave Export and DNP Slave Options modules.

1. Open ION Setup and connect to your meter, using Basic Mode.
2. In the Setup Assistant, navigate to Communications > 3rd Party Protocols and click on the DNP 3.0 tab.
3. Select the DNP feature you wish to configure (Parameter Map in this example) and click **Edit**.



4. The Setup Assistant guides you through DNP configuration. See the *ION Setup Online Help* for more information.

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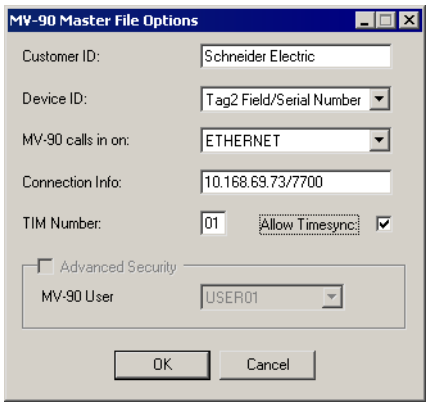
Configuring MV90

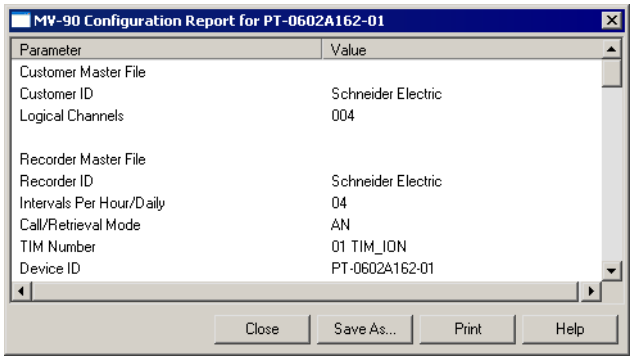
ION8600 meters can provide energy values to MV90 software for use in the MV90 database. In order to recognize and communicate with the meter, the MV90 software must be configured with certain information about the meter. Use ION Setup software (version 2.1 and later) to generate the necessary information to help with this configuration. You can then save this as a file (.DAT) to load into the MV90 database or print a hardcopy to enter it manually.

Using ION Setup

1. Open ION Setup and connect to your meter, using Basic Mode.
2. In the Setup Assistant, navigate to Reports.
3. Select MV90 from the list of reports and click **Display**. The MV90 assistant appears.



4. Enter the appropriate information in the fields and click **OK**. This information will be used to identify the meter in the MV90 database.
   You will be prompted for your password if Advanced Security is enabled **and** you select a user other than the one you are currently logged in as.
5. The MV90 configuration report is generated for the meter.



6. Click **Save As** to save the file or **Print** to print a hardcopy.

For more information, see the *MV90 and ION Technology* technical note, available from the PowerLogic website.

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Chapter
8

Time

This chapter covers the meter's clock and time synchronization. For information on IRIG-B GPS time synchronization, see the *IRIG-B GPS Time Synchronization* product option document.

In this chapter

- **Meter Clock Configuration 112**
  - Configuring the Meter Clock 112
    - Using the Front Panel 112
    - Using ION Setup 112
    - Using Designer 113
  - Clock Module Settings 113
- **Replacing the Battery 114**
  - To replace the battery 114
- **Time Synchronization 116**

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Meter Clock Configuration

The Clock module controls the meter's internal clock, which provides timestamps for data logged by the device. The clock needs to be configured properly to ensure that logged data has accurate timestamp information. The Clock module also receives the time synchronization signals sent to it by the workstation running ION software, updating the device's clock when required.

The Clock module's *Clock Source* setup register defines how the meter's internal clock auto-corrects drift from its internally calculated time. A separate time source (such as a GPS receiver, or a DNP Master) can be used to synchronize the clock through a communications channel. By default, the clock is set to synchronize from the line frequency.

See the *ION Reference* for more information on the Clock module.

Configuring the Meter Clock

Use ION software to change the meter's clock settings.

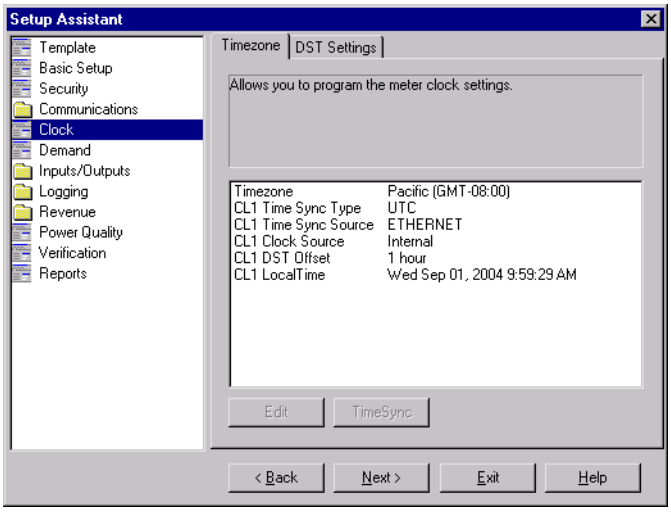
Using the Front Panel

You cannot configure the time via the front panel.

Using ION Setup

The Clock Setup Assistant helps you configure the Clock module.

1. Open ION Setup and connect to your meter, using Basic Mode.
2. In the Setup Assistant, navigate to the Clock folder.



3. Click on the Timezone tab to configure your meter's clock settings. Select a parameter and click Edit to change.

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4. Click on the DST Settings tab to configure your meter's daylight savings periods for up to 20 years. Select a parameter and click Edit to change.

Using Designer

Open your meter in Designer and navigate to the Meter Clock Setup framework. Right-click on the Clock module to edit.

Clock Module Settings

The setup registers in the Clock module specify timezone and Daylight Savings Time (DST) parameters and time synchronization functions.

Setup Register	Function	Default
TZ Offset	Sets the timezone the device is in, relative to Greenwich Mean Time.	0
DST Start 1 … DST Start 20	The date and time when DST begins for 20 separate years.	Refer to the *ION Device Templates* at www.powerlogic.com for the DST Start and DST End defaults for the twenty separate years.
DST End … DST End 20	The date and time when DST ends for 20 separate years.	
DST Offset	The amount of time the clock is changed when DST begins or ends.	3, 600 seconds
Time Sync Source	Specifies the communications port that receives time sync signals.	COM3
Time Sync Type	Specifies the type of time sync signal (Local or Universal time).	UTC
Clock Source	Specifies the clock's time synchronization signal source (line frequency, communications signals, or internal crystal).	Line Frequency

TIP

When modifying setup registers of the Clock module in Designer, use the Format option to convert between UNIX and conventional time. Refer to the description of the Clock module in the online *ION Reference* for more details.

Typically, the *DST Start* and *DST End* registers do not have to be reconfigured for users in North America. The factory defaults are the DST start and end dates for 20 years, in UNIX time (the number of seconds since 00:00:00 UTC on Jan. 1, 1970).

Refer to the technical note *Time Synchronization and Timekeeping* for further details on using the meter's time synchronization functions.

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Replacing the Battery

The battery in the ION8600 meter keeps the real time clock running when primary power is lost (loss of three phases). Assuming the battery was fresh when installed, it runs the clock for about four years on an unpowered meter. When the meter is fully powered, all battery drain is effectively eliminated; in this case battery life is rated at 10 years minimum.

Replace the battery if the meter has been sitting for an extended period of time without power (+/- two years). If the meter will be without power for an extended length of time, disconnect the battery cable so that the battery maintains its 10-year shelf life.

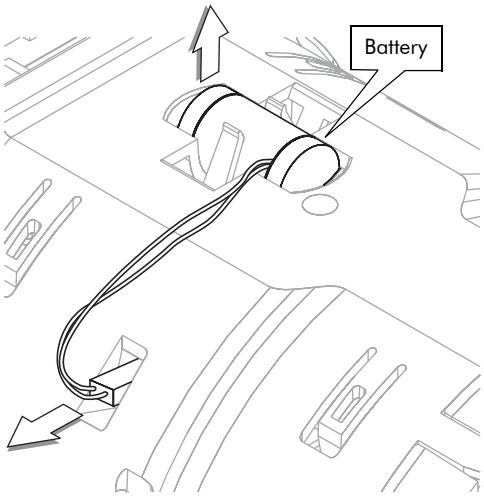
The battery can be changed when the meter is either powered or unpowered **(recommended)**.

NOTE

Replacing the battery on an unpowered meter affects the internal clock settings. See "Event Screen/Event Log confirmation (Unpowered Meter)" on page 115 for details.

To replace the battery

1. Remove the cover of the meter.
2. Remove the two Phillips screws that hold the EMI (Electromagnetic Interface) shield in place and carefully slide the shield off.
3. Carefully disconnect the battery wire from the meter and remove the battery from the housing.



4. Place the new 3.6V Utility Meter LI battery in the housing and connect the wire to the meter.
5. Replace the EMI shield and the two Phillips screws.
6. Replace the cover of the meter.

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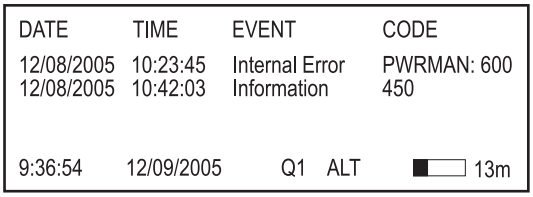
Event Screen/Event Log confirmation (Unpowered Meter)

On an unpowered meter, the battery powers the internal clock. Removing the old battery effectively stops the meter's clock until the battery is replaced. Once replaced, the clock restarts at its last known power-down time. The ION8600 logs this as an event, which can be viewed from the Event Log on the meter's front panel (see "ALT mode default display screens" on page 172 for details on navigating to the Event Screen). The Event Log appears as the following screen:


DATE TIME EVENT CODE
12/08/2005 10:23:45 Internal Error PWRMAN: 600
12/08/2005 10:42:03 Information 450
9:36:54 12/09/2005 Q1 ALT 13m

NOTE

Error codes are written at the time of power up, as indicated by their ION event timestamp

The meter records the following event codes after battery replacement on an unpowered meter:

Error Code	Explanation	Recommended Action
450	Seen only in combination with a '600' event.	Refer to 600, below.
600	Loss of up to 10 minutes of billing data and time late by as much as 10 minutes	Connect to the meter with ION software and synchronize the meter's internal clock. See "Configuring the Meter Clock" on page 112 for details. Double-check battery installation (if required).

For details on resetting the meter's internal clock, see "Configuring the Meter Clock" on page 112.

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Time Synchronization

Time synchronization lets you synchronize your meter's internal clock with all of the other meters, devices, and software in a network. Once synchronized, all data logs have timestamps that are relative to a uniform time base. This allows you to achieve precise sequence-of-events and power quality analyses. Use ION software to broadcast time signals across the network, or utilize an external source (such as an NTP server or DNP Master) to synchronize your meter's clock.

Refer to the technical note *Time Synchronization & Timekeeping* for more information on implementing time synchronization.

For information on IRIG-B GPS time synchronization, see the *IRIG-B GPS Time Synchronization* product option document.

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Chapter
9

Demand

This chapter explains how to configure and view demand values on your meter.

In this chapter

- **Introduction** **118**
- **Configuring Demand** **118**
  - Using the Front Panel 118
  - Using ION Setup 118
  - Using Designer 119
  - Sliding Window Demand Module Settings 119
  - Thermal Demand Module Settings 120
- **Demand Forgiveness** **121**
  - Additional Information 123
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Introduction

Demand is a measure of average power consumption over a fixed time interval. Peak (or maximum) demand is the highest demand level recorded over the billing period. Two methods of measuring demand are with Thermal Demand modules and Sliding Window Demand modules. These modules are configured to calculate the average current demand and kW, kVAR and kVA demand. The setup registers in the demand modules define time intervals for demand calculations, setting the sensitivity of the module's operation.

See the *ION Reference* for more information about these modules.

Configuring Demand

Use ION software to change your meter's demand settings.

Using the Front Panel

1. Press and hold the Alt/Enter button for a few seconds to access the Setup Menu.
2. Scroll using the Up or Down arrow buttons to select Demand Setup. Press the Alt/Enter button to access Demand Setup parameters.
3. Scroll to the desired parameters using the Up or Down arrow buttons. Press the Alt/Enter button to access each parameter.

   Use the Up or Down buttons to edit the value of each parameter.

NOTE

You may be prompted for the meter's password the first time you attempt to change any values.

4. Select Yes to confirm the change.

Using ION Setup

The Demand Setup Assistant helps you configure Sliding Window Demand only. This screen also contains two registers used for configuring Sliding Window Demand while the meter is in TEST Mode.

1. Open ION Setup and connect to your meter, using Basic Mode.
2. In the Setup Assistant, navigate to the Demand folder.

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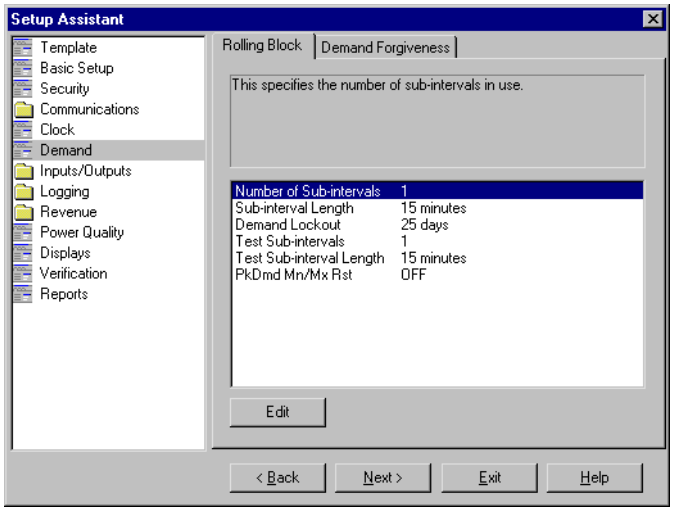

3. Configure Rolling Block demand by selecting a register and clicking Edit.

You can configure **both** the Sliding Window Demand and Thermal Demand modules using Advanced Mode.

1. Connect to your meter, using Advanced Mode.
2. Click on the module you wish to configure.

Using Designer

Open your meter in Designer and navigate to the Demand Setup framework. There are two sections: Sliding Window Demand setup and Thermal Demand setup. Right-click on a module to edit.

NOTE

For Time-of-Use Demand setup, go to Advanced Setup > Revenue Framework folder (in Designer).

Sliding Window Demand Module Settings

Sliding Window Demand is often referred to as Rolling Block Demand. To compute sliding window demand values, the Sliding Window Demand module uses the sliding window averaging (or rolling interval) technique which divides the demand interval into sub-intervals.

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The demand is measured electronically based on the average load level over the most recent set of sub-intervals. This method offers better response time than fixed interval methods.

Setup Register	Function	Default
Sub Intvl	The time, in seconds, in the sliding window demand sub-interval.	900
#SubIntvls	The number of sub-intervals in the sliding window.	1
Pred Resp	The speed of Predicted Demand calculations; use higher values for faster prediction (70 to 99 recommended).	70
Update Rate	Defines the update rate of the *SWinDemand* output register	End of Sub-Interval

Thermal Demand Module Settings

The Thermal Demand module calculates thermal demand over a specified length of time. It uses a method which is equivalent to thermal averaging. For thermal averaging, the traditional demand indicator responds to heating of a thermal element in a Watt-Hour meter. Adjust the Thermal Demand module's calculation to mimic this technique by changing the *Time Const* and I*nterval* setup parameters.

Setup Register	Function	Default
Interval	The time, in seconds, in the thermal demand interval.	900
Time Const	The sensitivity to changes in the source signal; higher values provide faster response time (common values are 63 and 90).	90

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Demand Forgiveness

Demand Forgiveness is the time programmed to the meter during which demand (and therefore peak demand) will not be calculated in the power restoration period following a total power outage.

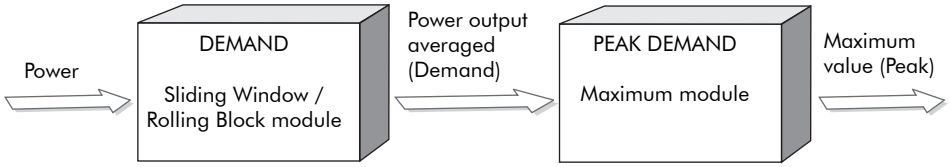
During power-up following a complete power outage, customer equipment consumes a higher than normal amount of power. The Demand Forgiveness feature lets a utility forgive the customer for peak demand penalties that may arise from power-up following a power outage (should the outage exceed a user-specified period of time).

Demand and Peak Demand Module Overview

Power utilities generally bill commercial customers based on their peak usage levels, called *peak demand* (in kW), and *energy consumption* (in kWh). Demand is a measure of average power consumption over a fixed time interval, typically 15 minutes. Peak (or maximum) demand is the highest demand level recorded over the billing period. *Sliding window/rolling block demand* is one method of measuring demand.

To compute sliding window demand values, the Sliding Window/Rolling Block Demand module uses the *sliding window averaging* (or *rolling interval*) technique which divides the demand interval into sub-intervals. The demand is measured electronically based on the average load level over the most recent set of sub-intervals.

In the following diagram, the Sliding Window/Rolling Block module labeled "Demand" calculates demand from the power input by measuring and averaging the power over a set interval. The demand value is then output to a Maximum module labeled "Peak Demand" that records the highest demand value over time (peak demand).



For information on ION modules, refer to the online *ION Reference.*

Demand and Peak Demand Module Behavior During Demand Forgiveness

A peak demand value is the highest demand value since the last peak demand reset. The Demand Forgiveness framework sets the Sliding Window/Rolling Block module (and the Thermal Demand module) inputs to zero during a Demand Forgiveness period. This method allows demand interval data to accurately reflect a complete interval that includes data:

- prior to an outage
- during the Demand Forgiveness period (zero values)
- after the Demand Forgiveness period

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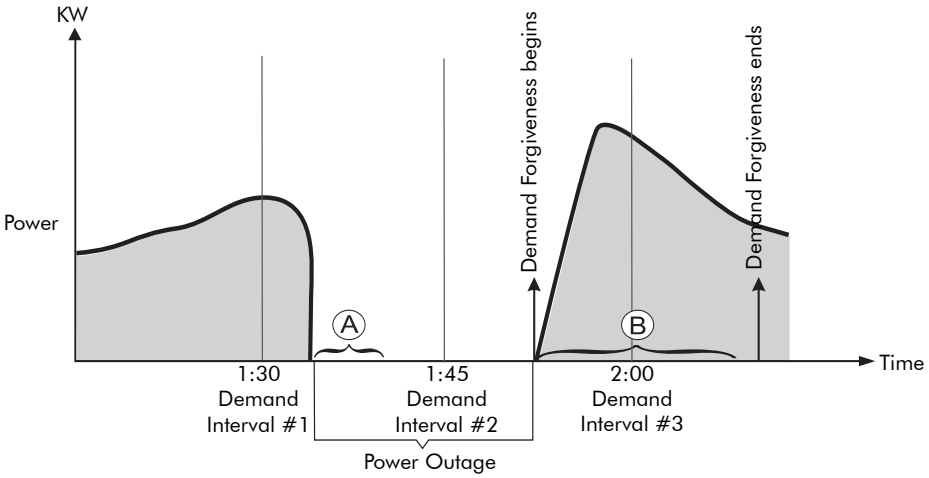
NOTE

During a Demand Forgiveness period, Demand module inputs are set to zero and do not reflect actual demand. *These values should not be used to calculate energy for billing purposes*. Energy values are not affected and will reflect actual energy consumption during the Demand Forgiveness period.

The settings listed below must be made for Demand Forgiveness functionality. These settings can be accessed from ION Setup software; refer to "Using ION Setup" on page 124.

- *Minimum Outage Duration* lets you specify the amount of time (in seconds) that the power must be out before the Demand Forgiveness period begins.
- *Demand Forgiveness Duration* lets you specify the amount of time (in seconds) that demand is forgiven (demand inputs are zero).
- *Update Rate* lets you define the update rate of the *SWinDemand* output register and is set to EVERY SECOND by default for revenue-related demand modules. With this setting, demand value measured is updated once per second.
- *Outage Voltage* (line-to-line average in unscaled meter units) lets you define a voltage level that is considered an outage. This is set to 20 volts by default.



Ⓐ The specified amount of time that the power must be out before demand is forgiven

Ⓑ The specified amount of time that demand is delayed during the Demand Forgiveness period

The preceding diagram shows an example of a meter that is set up for Demand Forgiveness. The Sliding Window/Rolling Block Demand module is averaging demand values at 15 minute intervals. During interval #1, the meter has a power outage that lasts for 18 minutes. The power outage is defined by a system voltage of 20 volts which has been specified in the *Outage Voltage* setting. The *Minimum Outage Duration* setting is specified as 10 minutes, so this is amount of time that the power must be out before demand can be forgiven. The *Demand Forgiveness Duration* setting is specified as 1800 seconds (30 minutes), so for 30 minutes following power restoration, demand inputs are zero. The power is restored during interval #2, where the surge of power consumption during power-up is included in the Demand Forgiveness period and has a value of zero.

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Additional Information

NOTE

To function properly, the Demand Forgiveness feature requires firmware v310 or greater.

The following points are important to note:

- The following demand input values are zero for kQ, kW, kVA, and kVAR during the Demand Forgiveness period:
  - Delivered
  - Received
  - Delivered + received
  - Delivered – received
  - Q1, Q2, Q3, Q4
- If a new peak is set prior to a power outage, it will persist.
- Even though demand is zero during the Demand Forgiveness period, a new peak could be set if the demand was very high prior to the power outage, or after the Demand Forgiveness period ends.
- Demand Forgiveness works for auxiliary and blade powered meters.
- All ION modules in the Demand Forgiveness framework are fully locked.
- If a Demand Forgiveness period is initiated, and another power outage occurs that is less than the time specified in the *Minimum Outage Duration* setting, then the Demand Forgiveness period continues. If a second outage is greater than the time specified in the *Minimum Outage Duration* setting, then the Demand Forgiveness period restarts.
- Both the power outage downtime and the Demand Forgiveness downtime are stored within the Demand Forgiveness framework. The Store modules preserve a timestamp that is viewable in Vista.
- The Sliding Window/Rolling Block demand module *Update Rate* setup register must be set to EVERY SECOND (default).
- If Demand Forgiveness is enabled on an auxiliary-powered meter and there is no power on the blades, then the meter assumes that this is an outage. When power is applied to the blades, demand is forgiven for the specified time.
- If Demand Forgiveness is enabled and the meter is unplugged for servicing or other reasons, then the Demand Forgiveness framework assumes there was an outage and demand is forgiven for the specified time.
- For meters where Demand Forgiveness is enabled at the factory (e.g. RMICAN Canadian revenue meters), demand will not be measured when the meter is first put into service. Instead demand is forgiven for the specified time.

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Configuring Demand Forgiveness

Demand Forgiveness is disabled by default. To enable Demand Forgiveness, use ION Setup software to set the:

- External Boolean module named "Demand Forgiveness Enable" to ENABLE.
- minimum outage duration.
- demand forgiveness duration.
- outage voltage.

⚠ CAUTION

If Demand Forgiveness is enabled, do not use demand values to calculate energy for billing purposes.

Using the Front Panel

You cannot enable or edit Demand Forgiveness settings via the front panel.

Using ION Setup

ION Setup version 1.1 and later supports the Demand Forgiveness feature:

1. Launch ION Setup and double-click the Setup Assistant.
2. Select the Demand setup screen, and click on the Demand Forgiveness tab.
3. Select *Demand Forgiveness Enable*.

   Click Edit, (provide a password if requested), and select ON.
4. Select *Min Outage Duration*, and click Edit.

   Type the amount of time (in seconds) that the power must be out before the Demand Forgiveness period starts, and click OK.
5. Select *Demand Forgiveness Duration* and click Edit.

   Type the amount of time (in seconds) that demand is forgiven (demand inputs are zero), and click OK.
6. If required, select *Outage Voltage* and click Edit.

   Type the minimum voltage (line-to-line average in unscaled meter units) that is considered an outage; this is set to 20 volts by default but you can adjust this.

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Chapter
10

Inputs / Outputs

This chapter provides information on the meter's various digital and analog inputs and outputs (I/O).

Refer to your Installation Guide for instructions on wiring inputs and outputs and for the general meter I/O specifications.

In this chapter

- **Introduction 126**
  - Specifying an I/O Port in an ION Module 128
  - Using the Onboard Digital Outputs 130
    - Output Modules 130
  - Using the Onboard Digital Inputs 132
  - Analog Outputs 133
    - Setting the Zero and Full Scales 133

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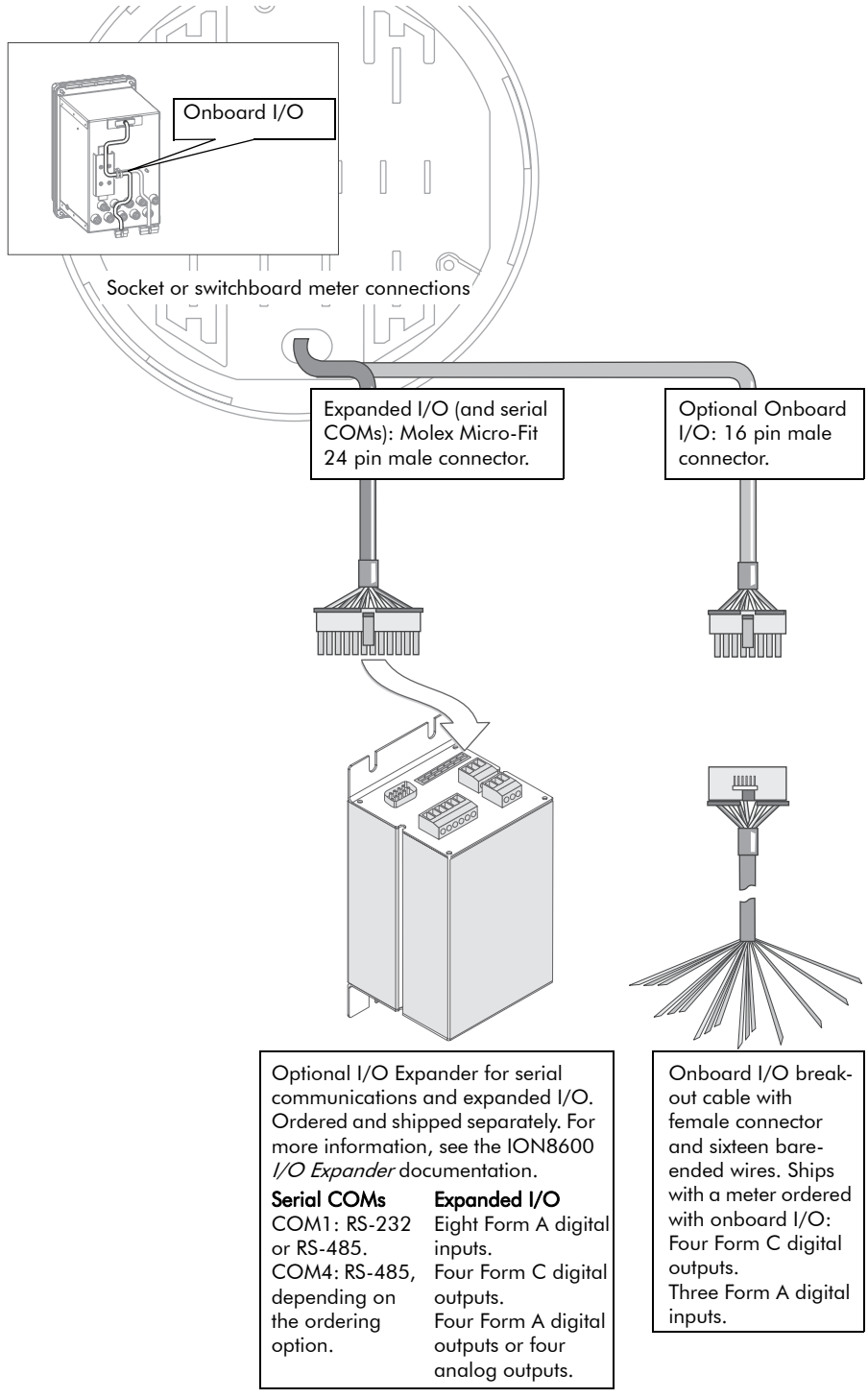
Introduction

The ION8600's digital and analog I/O ports simplify data gathering by importing a variety of data types into a single, common system.


Onboard I/O
Socket or switchboard meter connections
Expanded I/O (and serial COMs): Molex Micro-Fit 24 pin male connector.
Optional Onboard I/O: 16 pin male connector.
Optional I/O Expander for serial communications and expanded I/O. Ordered and shipped separately. For more information, see the ION8600 *I/O Expander* documentation.
Serial COMs
COM1: RS-232 or RS-485.
COM4: RS-485, depending on the ordering option.
Expanded I/O
Eight Form A digital inputs.
Four Form C digital outputs.
Four Form A digital outputs or four analog outputs.
Onboard I/O break-out cable with female connector and sixteen bare-ended wires. Ships with a meter ordered with onboard I/O:
Four Form C digital outputs.
Three Form A digital inputs.

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Onboard I/O

Onboard I/O for the ION8600 meters provides four Form C digital outputs and three Form A digital inputs for a variety of applications.

For example, you can use a Form A digital input to monitor a breaker to verify how many times the breaker trips. When the breaker has reached its limit for the number of trips, you can use the digital output to light an LED next to the breaker so field personnel are alerted. You can also use a Form C digital output to send KYZ pulsing information to third-party system equipment.

I/O Expander for ION8600 meters

For enhanced analog or digital I/O with the ION8600 meters, you can use an external I/O Expander. Complete information for the I/O Expander is available in the *I/O Expander Installation Guide*.

The I/O Expander equips an ION meter with eight digital inputs, four Form A digital outputs, and four Form C digital outputs, or four analog outputs (0 to 20 mA, –20 to 20 mA, or –1 to +1 mA) in place of the four Form A digital outputs. The I/O Expander also provides a convenient location for the ION meter's RS-232 and RS-485 communications wiring. The I/O Expander box is wired as a DTE device and does require a NULL modem cable/adapter to connect to the computer's serial port.

The I/O Expander is mounted separately, no more than 15 feet away from the meter. It connects to the meter via a standard Molex Micro-Fit 3.0 connector. RS-232 and RS-485 links are made via standard DB9 and captured-wire connectors located on the I/O Expander. The analog output version of the I/O Expander must be powered by an external source, a standard AC/DC supply.

As the I/O Expander board is external, you can install and configure I/O points without affecting the meter's operation. Terminal strips simplify connections to external equipment. Furthermore, the low-profile connectors between the meter and the I/O board let you easily remove the meter without disconnecting all the attached I/O wiring.

External I/O with Grayhill Products

You can change the number of inputs and outputs available for ION meters, or extend the functionality of the standard digital outputs through external I/O boards. Just plug Grayhill analog or digital I/O hardware modules into the boards. For more information, visit the PowerLogic website.

Meter	Digital Inputs	Digital Outputs	Analog Inputs	Analog Outputs
Option A	8	8	0	4
Option B	8	8	0	4
Option C	8	8	0	4

As with onboard I/O, the functionality of these external Grayhill hardware modules are controlled by ION software modules inside the meter. ION Digital Output, Analog Output, Pulser, and Calibration Pulser modules specify output signal characteristics, while the Digital Input or Analog Input modules define incoming signals.

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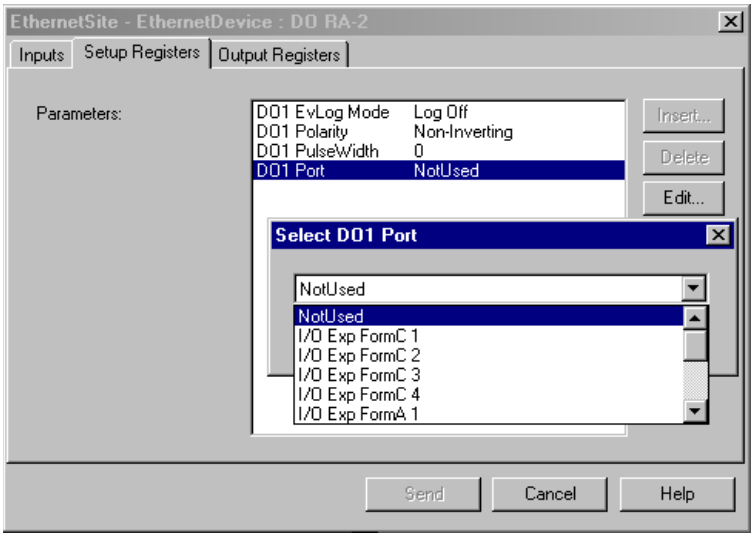
Refer to the *Digital and Analog I/O* technical note available from the PowerLogic website and the *ION8600 Installation Guide* for more information regarding digital and analog inputs and outputs.

Specifying an I/O Port in an ION Module

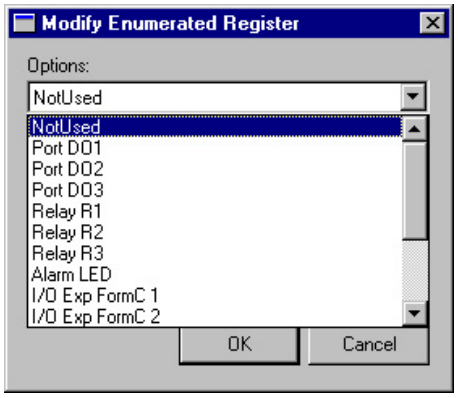
The Digital Output, Digital Input, Analog Output, Analog Input, Pulser, and Calibration Pulser modules have *Port* setup registers that allow you to specify which port handles the outgoing or incoming signals. To assign a port to one of these modules, simply modify the *Port* setup register by picking a port from the enumerated list. This can be done with both Designer and ION Setup.



The image above shows the enumerated list of the Port setup register as it is seen in ION Setup. Be aware that the list only displays those ports that are not yet assigned to another module. For example, the meter's factory configuration makes use of Digital Output DO4 (it is already assigned to Calibration Pulser module "kWh Pulser –D4"). If you create a new Digital Output module and set its *Port* setup register, the port DO4 does not appear in the list of available ports.

To make a port available, you must locate the module controlling the port and set its *Port* setup register to NOT USED (or delete the module entirely). The port now appears in the enumerated list.

The enumerated list only shows those ports which have not already been assigned to another module.
Port DO4 has already been assigned to another module, so it is absent from the list.



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Configuring Other Energy Pulsing Applications

To configure these LED outputs for other energy pulsing applications (for example, kVAh), link the appropriate MU Power Meter module output to the input of the Calibration Pulser module using Designer software.

The following table describes the ports that can be configured (in the Digital Output, Pulser, Digital Input, Analog Output, and Calibration Pulser modules) to handle outgoing or incoming signals.

NOTE

You must confirm the meter I/O options (onboard and/or Expander I/O) to determine which of the following apply to your meter.

Digital Output Port Names	Description
Port RA-1	Digital (Form A Solid State) Output port 1
Port RA-2	Digital Output port 2
Port RA-3	Digital Output port 3
Port RC-1	Digital (Form C Relay) Output port 1
Port RC-2	Digital Output port 2
Port RC-3	Digital Output port 3
Port RC-4	Digital Output port 4
kWh Pulse –LED	LED Output
kVARh Pulse –LED	LED Output
Analog Output Port Names	**Description**
Port Analog Out 1	Analog Output port 1
Port Analog Out 2	Analog Output port 2
Port Analog Out 3	Analog Output port 3
Port Analog Out 4	Analog Output port 4
Digital Input Port Names	**Description**
Port DI-S1	Digital (Status) Input port 1 (I/O Expander)
Port DI-S2	Digital Input port 2 (I/O Expander)
Port DI-S3	Digital Input port 3 (I/O Expander)
Port DI-S4	Digital Input port 4 (I/O Expander)
Port DI-S5	Digital Input port 5 (I/O Expander)
Port DI-S6	Digital Input port 6 (I/O Expander)
Port DI-S7	Digital Input port 7 (I/O Expander)
Port DI-S8	Digital Input port 8 (I/O Expander)
Port DI-S9	Digital Input port 9 (Onboard I/O)
Port DI-S10	Digital Input port 10 (Onboard I/O)
Port DI-S11	Digital Input port 11 (Onboard I/O)

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Using the Onboard Digital Outputs

Digital outputs are used for hardware relay control or pulse counting applications. For example, an ION meter's digital outputs can provide on/off control signals for capacitor banks, generators, and other equipment. The digital output ports can also send out status signals or kWh pulses, if the receiving device determines energy usage by counting pulses.

Onboard I/O for the ION8600 meters provides four Form C digital outputs and three Form A digital inputs. You can use a Form A digital input to monitor a breaker to verify how many times the breaker trips. When the breaker has reached its limit for the number of trips, you can use the digital output to light an LED next to the breaker so field personnel are alerted. You can also use a Form C digital output to send KYZ pulsing information to third-party system equipment.

All digital outputs can deliver a continuous signal or a pulse. (Contact Schneider Electric for complete information regarding relay applications.)

⚠ CAUTION

The relay outputs of the meter should never be used for primary protection functions. Be sure that you are familiar with warnings at start of this document, as well as those presented your *ION8600 Installation Guide*.

These outputs can be controlled by Digital Output modules, Pulser modules, or Calibration Pulser modules, depending on the application. For relay and control, the Digital Output module is used. For pulsing applications, the Pulser and Calibration Pulser modules are generally used. All of these modules can act as intermediaries between the hardware port and the other modules in the meter. They define the characteristics of outgoing signals.

Output Modules

Both the Form A and Form C relays can be controlled with Digital Output modules, Pulser modules, or Calibration Pulser modules. By default, six Digital Output modules (labeled DO RA-2 to DO RA-4 and DO RC-1 to DO RC-4) are already created for this purpose. You can either use these modules, or create and configure other modules to control the output ports.

- **Calibration Pulser modules** allow you to generate high accuracy energy pulses for calibration testing purposes. They integrate instantaneous power inputs.
- **Digital Output modules** accept Boolean inputs, and output a continuous signal or pulses.
- **Pulser modules** convert instantaneous pulses to pulses or transitions.

Consult the online *ION Reference* if you require more information about these ION modules.

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Configure the settings of the controlling module to match your requirements. The settings in these modules are as follows:

ION Module	Setup Registers	Available Settings	Creation Default	Description
Digital Output	Port	Not Used I/O Exp FormC 1 I/O Exp FormC 2 I/O Exp FormC 3 I/O Exp FormC 4 I/O Exp FormA 1 I/O Exp FormA 2 I/O Exp FormA 3 I/O Exp FormA 4 On-Board Form C 1 On-Board Form C 2 On-Board Form C 3 On-Board Form C 4	Not Used	The output hardware channel
	Pulse Width	0 to 2000000	0	Pulse Width, in seconds (0 for continuous pulse)
	Polarity	Inverting or Non-Inverting	Non-Inverting	Inverted or non-inverted output
	EvLog Mode	Log on or Log off	Log off	Whether or not to log status changes in the Event Log
Pulser	Port	As per Digital Output, above	Not Used	The output hardware channel
	PulseWidth	0.020 to 2000000	1	Pulse width, in seconds
	OutputMode	Pulse or KYZ	Pulse	Full pulse or KYZ (transition pulse)
	Polarity	Inverting or Non-Inverting	Non-Inverting	Inverted or non-inverted output
Calibration Pulser[1]	Port	As per Digital Output, above	Not Used	The output hardware channel
	Pulse Width	0.010 to 1.000	0.05 (5A meter) 0.02 (1A meter)	Pulse Width, in seconds
	Kt	0.01 to 1000000000	1.8	Watts per pulse
	Int Mode	Forward, Reverse, Absolute, or Net	Absolute	Integration modes that may be selected
	OutputMode	Pulse or KYZ	Pulse	Full pulse or KYZ (transition pulse)

[1] See "Calibration Pulsing Relay DO4," below.

Ensure that the module's *Port* setup register matches the meter's output you want to control. If the port you want to use does not appear in the *Port* setup register's list, that port is in use by another module. Edit the port setup register of the module using that port and set it to NOT USED – the port will then be available to other modules.

Calibration Pulsing Relay DO RC-4

Solid-state relay DO RC-4 is factory configured for calibration pulsing and requires no further setup. The Calibration Pulser module labeled *kWh Pulse-LED* controls this port. By default, the module is linked to the *kW del+rec* output of the Arithmetic module labeled "*KW del, rec*" (this Arithmetic module is linked to the MU Power Meter module's *MU kW tot* output). The port will output a pulse for every 1.8 Wh accumulated (in NORMAL or TEST mode). This is the same pulsing rate as the LEDs on the front panel of the meter.

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Using the Onboard Digital Inputs

Digital inputs are necessary for status monitoring or pulse counting applications. Status monitoring can help you prevent equipment damage, improve maintenance, or track security breaches. Some common status monitoring applications are monitoring the closed/open positions of breakers, on/off status of generators, armed/unarmed conditions in a building alarm system, and over/under pressures of transformers.

The function of each status input is controlled by a Digital Input module; this module tells the meter how to interpret incoming signals. Digital Input modules can be linked with other modules for counting status changes.

NOTE

The onboard status inputs cannot be used for voltage sensing applications. Also note that your meter template (default configuration) may have factory configured Digital Input modules.

The settings in the Digital Input modules are as follows:

Setup Register	Available Settings	Default	Description
Input Mode	Pulse, KYZ	Pulse	Specifies complete pulse or KYZ transition pulse
EvLog Mode	Log On, Log Off	Log Off	Specifies whether or not to log status changes
Debounce	numeric	0.015	Setting for the mechanical contact bounce, in seconds
Polarity	*Fixed at* NON-INVERTING	NON-INVERTING	Specifies a Non-inverted (or level) pulse
Port	I/O MODULE IN1 *to* I/O MODULE IN 8, NOT USED	NOT USED	Specifies which hardware port the module controls

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Analog Outputs

An ION meter's analog outputs act as transducers. The meter measures power and energy, and then sends that information via the analog outputs to a remote terminal unit (RTU). The analog outputs issue industry standard 0 to 20 mA current signals.

Four Analog Output modules control the optional I/O Expander's analog output. These modules are not linked or configured. Link the numeric output of another ION module to the *Source* input of the Analog Output module—this value is represented on the I/O Expander's analog output port. Setup the *Zero Scale* and *Full Scale* setup registers of the Analog Output module to the numeric range you want to emulate. The settings in these modules are as follows:

Analog Output Module			
Setup Registers	**Available Settings**	**Default**	**Description**
Port	I/O EXP AnOut 1 to I/O EXP AnOut 4, NOT USED	NOT USED	Specifies the output hardware channel.
Full Scale	-1×10^9 to 1×10^9	N/A	Sets the measured value that will create the maximum possible output on the analog output hardware port.
Zero Scale	-1×10^9 to 1×10^9	N/A	Sets the measured value that will create the minimum possible output on the analog output hardware port.

Ensure that the module's *Port* setup register matches the I/O Expander's output you want to control. If the port you want to use does not appear in the *Port* setup register list, that port is in use by another module. Edit the *Port* setup register of the module using that port and set it to NOT USED – the port is then available to other modules.

See the *ION8600 Meter I/O Expander Installation and Basic Setup* manual and the technical note *Digital and Analog I/O* available from the PowerLogic website for more information.

Setting the Zero and Full Scales

You control external devices by delivering a specific current or voltage that is proportional to the source input. This is done by setting the Full and Zero Scale setup registers and the hardware Port that the output is sent to. Use Designer software to configure these setup registers in the Analog Output module.

The Zero Scale setup register defines the source input value that creates the *minimum* current output on the analog device.

The Full Scale setup register defines the source input value that creates the *maximum* current output on the analog device. The Full Scale is determined by the input to the Analog Output ION module (which is commonly connected to kW). The Full Scale value is the maximum kW expected.

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The following table describes setting your Zero Scale and Full Scale to use a limited portion of the output's range.

NOTE

This table assumes the source input varies between zero and the full scale setting. If the source input falls below zero the output will not be within the desired Output Range.

Output Type	Desired Output Range	Zero Scale setting	Full Scale setting
-1 to 1 mA	0 to 1 mA	negative value of Full Scale (e.g. -1000)	e.g. 1000
-20 to 20 mA	0 to 20 mA	negative value of Full Scale (e.g. -1000)	e.g. 1000
	4 to 20 mA	-1.5 times value of Full Scale (e.g. -1500)	e.g. 1000
0 to 20 mA	4 to 20 mA	-0.25 times value of Full Scale (e.g. -250)	e.g. 1000

See the *ION8600 I/O Expander Installation Guide* and the technical note *Digital and Analog I/O* for more information.

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Chapter
11

Energy Pulsing

This chapter provides instructions for configuring energy pulsing on your meter.

In this chapter

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Introduction

Your meter uses Calibration Pulser modules and Pulser modules for energy pulsing.

The Pulser module serves as an intermediary between other modules' pulse output registers (accepting them as pulse inputs) and a hardware output channel on the device. These modules are capable of sending pulses or pulse transitions to any hardware output channel.

The Calibration Pulser module is a highly accurate energy pulser used for verifying calibration on meters employed in billing applications. This module type serves as an intermediary between the power (kW, kVAR or kVA) outputs of the Power Meter module and a device's hardware output channel.

See the *ION Reference* for more information on these modules.

Configuring Energy Pulsing

Use ION software to change your meter's energy pulsing settings.

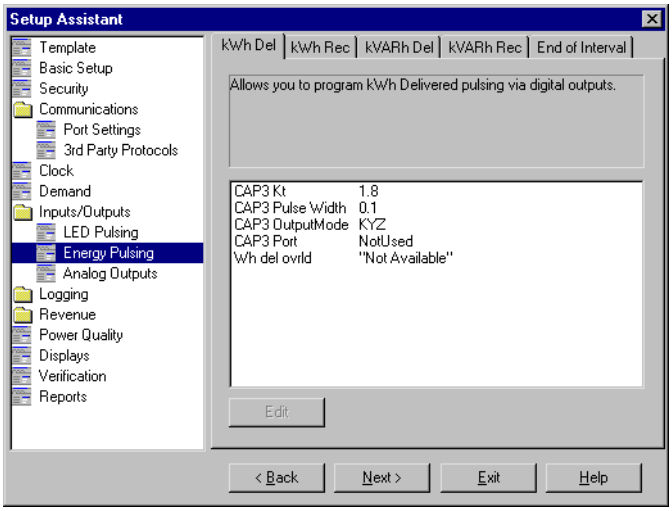
Using the Front Panel

You cannot configure Energy Pulsing using the front panel.

Using ION Setup

The Energy Pulsing Setup Assistant helps you configure the Calibration Pulser modules.

1. Open ION Setup and connect to your meter, using Basic Mode.
2. In the Setup Assistant, navigate to Inputs/Outputs > Energy Pulsing



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3. Click any of the first four tabs; each tab corresponds to a Calibration Pulser module. Configure each module as necessary.
4. Click the End of Interval tab to configure the end of energy pulsing.

You can configure ***both*** the Calibration Pulser and Pulser modules using Advanced Mode.

1. Connect to your meter, using Advanced Mode.
2. Click the module you wish to configure.

Using Designer

Open your meter in Designer and navigate to the Energy Pulsing Setup Framework. Right-click a module to edit.

Pulser Module Settings

The Pulser module contains the following setup registers:

Setup Register	Function	Default
Pulse Width	This register specifies the width of the output pulses (in seconds).	1
OutputMode	This register defines whether the output is a complete pulse or a transition pulse (KYZ).	Pulse
Polarity	This register specifies the polarity of a pulse output. It has no effect if *OutputMode* is KYZ.	Non-inverting
Port	This register specifies which hardware port the output appears on. Only those hardware channels that are still available appear in this list.	Not Used

Five common parameters (kWh del, kWh rec, kVARh del, kVARh rec, and kW sd del) are already linked to the Pulser modules for you.

NOTE

For safety reasons, no hardware channel is pre-selected. To make use of these links, you must configure the Pulser modules' *Port* setup registers to the appropriate hardware port that receives the output.

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Calibration Pulser Module Settings

Configure the solid-state output D4 for calibration pulsing by editing the setup registers of the module labeled "kWh Pulser –D4". By default, the output on a standard meter generates a pulse for every 1.8 Wh accumulated. This is the same pulsing rate as the middle front panel LED (controlled by a Calibration Pulser module labeled "kWh Pulser –LED"). Modify the pulsing rate of either channel by changing the value of the *Kt* setup register of the Calibration Pulser module controlling them (see below).

The following setup registers are available in the Calibration Pulser module:

Setup Register	Function	Default
Pulse Width	This register specifies the width of the pulses sent to the hardware channel (in seconds). The Calibration Pulser module maintains a minimum duty cycle of 50% on the output pulse train.	0.05
Kt	The numeric bounded register defines how much energy the module accumulates before a pulse is sent to the hardware channel. An industry standard for energy pulsing is 1.8, or one pulse per 1.8 energy-hours.	1.80
Int Mode	Specifies the modes of integration that may be selected.	Absolute
OutputMode	This register specifies whether the output is a complete pulse (Pulse) or a change of state transition (KYZ).	Pulse
Port	This register specifies which hardware port the pulse/KYZ transition appears on. Only those hardware channels that are still available appear in this list.	Not Used

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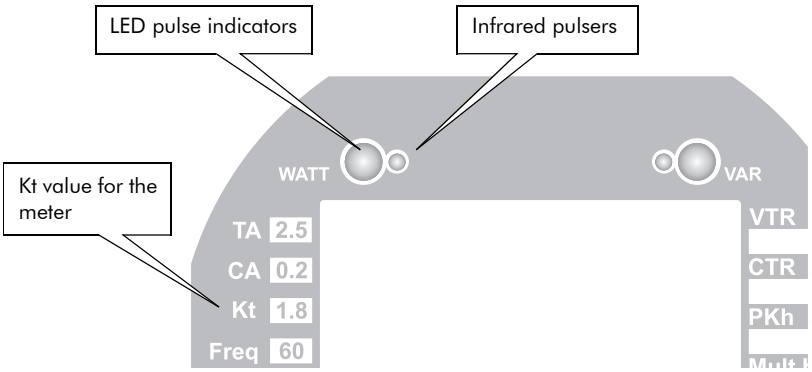
Energy Pulsing with LEDs

The two LEDs on the front panel are preconfigured for energy pulsing. The adjacent smaller infrared outputs are connected to the LEDs and pulse at the same rate.

The LED's pulse rate can be adjusted by modifying the Kt setup register in the Calibration Pulser module. The value entered defines how much energy the module accumulates before a pulse is sent to the hardware channel. The front panel WATT and VAR LEDs are factory set to the same pulse rate. The Kt value is shown on your meter's front panel label; the default setting for Kt depends on the form factor your meter services.



WATT – LED and VAR – LED

Like solid-state relay output DO4, the WATT – LED is controlled by a Calibration Pulser module that has its *Source* input linked to the *kW del+rec* output of the Arithmetic module labeled *"KW del, rec"*.

Similarly, the VAR – LED is controlled by a Calibration Pulser module that has its *Source* input linked to the *kVAR del+rec* output of the Arithmetic module labeled *"kVAR del, rec"*.

- For Form Factor 9S, 39S, 36S, and 76S meters, the default pulse rate of the front panel WATT LED is 1.8 (1.8 Watts per pulse). The VAR LED's Kt value is also 1.8.
- For Form Factor 35S meters, the default pulse rate of the front panel WATT LED is set at 1.2 (1.2 Watts per pulse). The Kt value for the VAR LED's is also 1.2.

Customizing Energy Pulsing

Changing the value for the *Kt* setup register of the controlling Calibration Pulser module lets you modify the pulsing rate of either channel. If you want to configure the LED port for a different pulsing application, you must re-link the *Source* input to the output register of a different instantaneous power quantity in one of the Arithmetic modules. Ensure that the quantity you choose originates from the MU (meter units) Power Meter module.

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Chapter
12

Logging

The ION8600 meter has powerful data logging and event recording capabilities. Data and event logs recorded by the meter are prioritized and stored onboard. Data is retrieved periodically by the ION Enterprise software Log Server (or other third party application).

If you use ION Enterprise software, all retrieved data from your system is stored in an ODBC-compliant database. The information in the database can be viewed and analyzed using ION Enterprise software applications such as Vista (for viewing), or Reporter (for organizing and presenting data).

In this chapter

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  - ION Event Priority Groups 149
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Data Logging

The meter ships with a comprehensive data-logging configuration. Information regarding the default logging capacity and default logging configuration can be found in "Default Logging Capacity" on page 144.

To learn more about the data recorder modules in your meter, refer to the *ION Reference*.

Configuring Data Logging

Use ION software to change your meter's logging settings.

Using the Front Panel

You cannot configure Logging using the front panel.

Using ION Setup

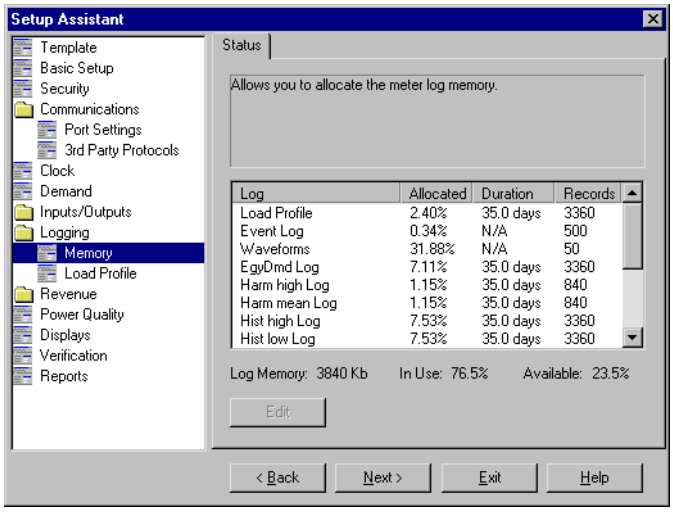
The Logging Setup Assistant helps you configure meter data logging.

1. Open ION Setup and connect to your meter, using Basic Mode.
2. In the Setup Assistant, navigate to the Logging folder.

   Use the two screens (Memory, Load Profile) to configure your logging settings.

Memory Screen

3. Select the Memory screen to re-allocate meter memory.



4. Select the Log you wish to configure and click **Edit**. You can change both the Log Duration (days) and the Log Size (records). Notice how changing these parameters affects the meter memory allocated to that log.

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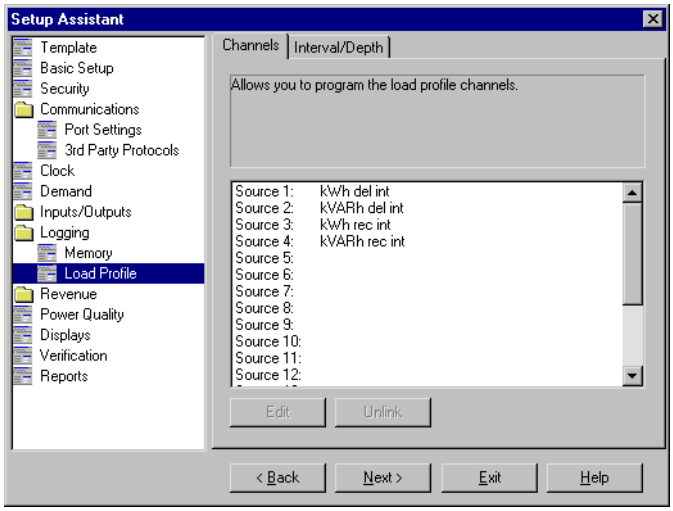
Load Profile Log Screen

5. Select the Load Profile Log screen to configure Data Recorder #1 (the Revenue Log).



6. Click the Channels tab to edit, link and unlink parameters.
7. Click the Interval/Depth tab to edit the interval and duration of the Load Profile log.

Changing the Parameters that are Logged

The meter's factory configuration logs a comprehensive set of energy, power and harmonics parameters. You cannot change which parameters are logged by configuring a setup register. If you are comfortable editing module links, you can change the logged parameters by linking the output registers you want logged to the inputs of an Data Recorder module.

NOTE

Adding or deleting a log's parameters is an advanced procedure, as it requires changes to the links between modules; use Designer (refer to the Designer section of the online *ION Enterprise Help)* or ION Setup.

Changing Waveform Recording

The Waveform Recorder modules do not require changes to their default settings. If you want to change the format of the recorded waveforms, refer to the Waveform Recorder module description in the *ION Reference*.

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Default Logging Capacity

The following table summarizes the default recording depths and recording intervals of the various Data recorders and Waveform recorders in the meter.

Log Types		ION8600C Default Depth	ION8600B Default Depth	ION8600A Default Depth	Interval
Energy Logs	Revenue Log	3360	3360	3360	900 seconds
	Loss Log	N/A	3360	3360	900 seconds
	EgyDmd Log	N/A	1350	3360	900 seconds
Time of Use Logs	TOU Logs	N/A	50	50	Triggered on demand
Historic Logs	Hist Logs	N/A	N/A	3360	900 seconds
Harmonic Logs	Harm Logs	N/A	N/A	840	3600
Disturbance Recorders	Transient Log	N/A	N/A	100	Triggered on demand
	Sag/Swell Log	100	100	100	Triggered on demand
EN50160 Logs (ION8600A only)		N/A	N/A	10	Daily, weekly, 10 min...

Changing the Log Depths

Change the value in the Data Recorder's *Depth* setup register to increase the number of records stored in the recorder. The *RecordMode* setup register controls how the Data Recorder will overwrite old records; refer to the Data Recorder module description in the online *ION Reference* before changing this setup register.

Changing the Frequency of Logging

The five Periodic Timer modules that control the frequency of different data recording are as follows:

- "Revenue Log Trg" controls the frequency of the logging of revenue values
- "Loss Log Trg" controls the frequency of Loss Compensation Data logging
- "EgyDmd Log Trg" controls the frequency of logging for the Energy and Demand Log (this log is used for generating reports using Reporter)
- "Hist Log Trg" controls the frequency of Historic Data logging
- "Harm Log Trg" controls the frequency of Harmonics logging

⚠ CAUTION

Programming your meter to write any data recorder at continuous intervals lower than 60 seconds (heavy logging configuration) may cause loss of data in the event of a power failure. Use of an uninterruptible power supply (UPS) is recommended for such heavy logging configurations.

Change the value in the *Period* setup register to change the frequency of data logging (Period values are specified in seconds). Do not change the *Sync Mode* setup register.

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Default Logging Configuration

The following sections describe each Data Recorder and the parameters they log.

Revenue Log

The *Revenue Log* (Data Recorder #1) is configured for use with UTS MV90 billing software. The Revenue log is located through the following folder path on the meter's program: **Advanced Configuration > Revenue Framework > Energy**. The default values logged by the Revenue Log are as follows:

Parameter	Description
kWh del int	Interval kWh delivered
kWh rec int	Interval kWh received
kVARh rec int	Interval kVARh delivered
kVARh rec int	Interval kVARh received
kVAh rec int	Interval kVAh delivered
kVAh rec int	Interval kVAh received
kWh del	kWh delivered
kWh rec	kWh received

Parameter	Description
kVARh del	kVARh delivered
kVARh rec	kVARh received
kVAh del	kVAh delivered
kVAh rec	kVAh received
kWh loss int	Interval kWh total losses (Tran + Line)
kVARh loss int	Interval kWh total losses
Period Length	Logging Period in seconds
Period Status	Logging Period verification

Historic Data Logging

Three data recorders are used to record "standard" power system quantities, such as phase current, phase voltage and power factor. These recorders are labeled *Hist Mean Log*, *Hist High Log*, and *Hist Low Log*. They are located through this folder path on the meter's program: **Advanced Configuration > Historic Data Logging**. By default, they log the following ION output register values:

Hist Mean Log	
Vll ab mean	I avg mean
Vll bc mean	I 4 mean
Vll ca mean	kW tot mean
Vll avg mean	kVAR tot mean
V unbal mean	kVA tot mean
Ia mean	PF lag mean
Ib mean	PF lead mean
Ic mean	Freq mean

Hist High Log	
Vll ab high	I avg high
Vll bc high	I 4 high
Vll ca high	kW tot high
Vll avg high	kVAR tot high
V unbal high	kVA tot high
Ia high	PF lag high
Ib high	PF lead high
Ic high	Freq high

Hist Low Log	
Vll ab low	I avg low
Vll bc low	I 4 low
Vll ca low	kW tot low
Vll avg low	kVAR tot low
V unbal low	kVA tot low
Ia low	PF lag low
Ib low	PF lead low
Ic low	Freq low

Loss Log

One *Loss Log* recorder is configured to record loss values. It is located in the following folder path on the meter's program:

Advanced Configuration > Revenue framework > Energy framework.

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By default, it logs the following ION parameters -- note that the parameters differ depending on the meter template:

Template	Loss Log Parameter	Description
35S and Default	MU Ia ^ 2h int	Phase A interval current squared hours
35S and Default	MU Ib ^ 2h int	Phase B interval current squared hours
35S and Default	MU Ic ^ 2h int	Phase C interval current squared hours
35S only	MU Vll ab ^ 2h int	Phase A interval voltage Line-to-Line squared hours
35S only	MU Vll bc ^ 2h int	Phase B interval voltage Line-to-Line squared hours
35S only	MU Vll ca ^ 2h int	Phase C interval voltage Line-to-Line squared hours
Default (9S-39S/36S-76S)	MU Vln a ^ 2h int	Phase A interval voltage Line-to-Neutral squared hours
Default (9S-39S/36S-76S)	MU Vln b ^ 2h int	Phase B interval voltage Line-to-Neutral squared hours
Default (9S-39S/36S-76S)	MU Vln c ^ 2h int	Phase C interval voltage Line-to-Neutral squared hours

Harmonics Logging

Two recorders provide various harmonics logs, including K-factor and Total Harmonics Distortion (THD). These recorders are labeled *Harm Mean Log* and *Harm High Log*. They are located through the following folder path on the meter's program: **Advanced Configuration > Harmonics Logging**.

By default, they log the following ION output register values:

Harm Mean Log	
V1 THD mean	I1 K Fac mean
V2 THD mean	I2 K Fac mean
V3 THD mean	I3 K Fac mean
I1 THD mean	
I2 THD mean	
I3 THD mean	

Harm High Log	
V1 THD high	I1 K Fac high
V2 THD high	I2 K Fac high
V3 THD high	I3 K Fac high
I1 THD high	
I2 THD high	
I3 THD high	

Time-of-Use Logging

Six data recorders are used to record energy and demand values based on the rates (A, B, C, D) set in the Time of Use (TOU) module. These recorders are labeled as follows: *TOU kWh Log*, *TOU kVA(R)h Log*, *TOU kW/VAR sd Log*, *TOU kW/VAR td Log*, *TOU kVA sd Log*, and *TOU kVA td Log*. They are located through the following folder path on the meter's program: **Time of Use**. By default, these data recorders log the following ION output register values:

TOU kWh Log
kWh del A
kWh rec A
kWh del B
kWh rec B
kWh del C

TOU kVA(R)h Log	
kVARh del A	kVAh del A
kVARh rec A	kVAh rec A
kVARh del B	kVAh del B
kVARh rec B	kVAh rec B
kVARh del C	kVAh del C

TOU kW/VAR sd Log	
kW sd mx del A	kVAR sd mx del A
kW sd mx rec A	kVAR sd mx rec A
kW sd mx del B	kVAR sd mx del B
kW sd mx rec B	kVAR sd mx rec B
kW sd mx del C	kVAR sd mx del C

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TOU kWh Log
kWh rec C
kWh del D
kWh rec D

TOU kVA(R)h Log	
kVARh rec C	kVAh rec C
kVARh del D	kVAh del D
kVARh rec D	kVAh rec D

TOU kW/VAR sd Log	
kW sd mx rec C	kVAR sd mx rec C
kW sd mx del D	kVAR sd mx del D
kW sd mx rec D	kVAR sd mx rec D

TOU kW/VAR td Log	
kW td mx del A	kVAR td mx del A
kW td mx rec A	kVAR td mx rec A
kW td mx del B	kVAR td mx del B
kW td mx rec B	kVAR td mx rec B
kW td mx del C	kVAR td mx del C
kW td mx rec C	kVAR td mx rec C
kW td mx del D	kVAR td mx del D
kW td mx rec D	kVAR td mx rec D

TOU kVA sd Log	
kVA sd mx del A	kVA sd mx del A
kVA sd mx rec A	kVA sd mx rec A
kVA sd mx del B	kVA sd mx del B
kVA sd mx rec B	kVA sd mx rec B
kVA sd mx del C	kVA sd mx del C
kVA sd mx rec C	kVA sd mx rec C
kVA sd mx del D	kVA sd mx del D
kVA sd mx rec D	kVA sd mx rec D

TOU kVA td Log	
kVA td mx del A	kVA td mx del A
kVA td mx rec A	kVA td mx rec A
kVA td mx del B	kVA td mx del B
kVA td mx rec B	kVA td mx rec B
kVA td mx del C	kVA td mx del C
kVA td mx rec C	kVA td mx rec C
kVA td mx del D	kVA td mx del D
kVA td mx rec D	kVA td mx rec D

For more information refer to "Configuring Time of Use" on page 158 as well as the TOU module description in the online *ION Reference*.

ION Enterprise Reporting

One data recorder is configured to provide power system data for the Reporter software. It is located through the following folder path on the meter's program: **Advanced Configuration > Revenue Framework > Reporting**. This recorder is labeled *Egy Dmd Log*. If any input links to this module are changed, Reporter will not be able to create reports from the device's logs. If you use Reporter, do not change the parameters that are logged in the *Egy Dmd Log*.

Sag/Swell and Transient Logging

Two data recorders provide details of these power quality events. They are located through the following folder path on the meter's program: **Advanced Configuration > Power Quality > Sag/Swell/Transient Detection**. These data recorders, by default, log the following ION output register values:

Sag/Swell Log			
DistDur	DistV2Engy	DistV1Engy	DistV3Engy
DistV1Min	DistV3Min	DistV2Min	DistNominal
DistV1Max	DistV3Max	DistV2Max	SwellLim
DistV1Avg	DistV3Avg	DistV2Avg	SagLim

Transient Log			
TranV1Dur	TranNominal	TranV2Max	PT Sec
TranV1Max	Threshold	TranV3Dur	CT Prim
TranV2Dur	PT Prim	TranV3Max	CT Sec

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High Speed Modules in the ION8600C

In the ION8600C meter, the update period for the following modules are 1-second. Measurement periods for these modules are configured in Designer or ION Setup.

Alert Module	Modbus Slave Module
And/Or Module	One-Shot Timer Module
Convert Module	Pulser Module
Digital I/O Module	Pulse Merge Module
Display Module	Sag/Swell Module
DNP Slave Export Module	Setpoint Module
Min/Max Module	

EN50160 Compliance Logging

For more information about EN50160 data logging, refer to the technical note *Power Quality: ION Meters and EN50160.*

Viewing Data Logs

See the Report chapter. You can also view Data Logs using ION Setup.

1. Open your meter in ION Setup, using Basic Mode.
2. Navigate to View > Data Screens > Data Recorders. The following logs are available for viewing:
   - Average Harmonics
   - Energy & Demand
   - Historic Average, Historic Highs, Historic Lows
   - Maximum Harmonics
   - Revenue Log
   - Sags & Swells
   - Transformer Losses
   - Transients (ION8600A only)

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Event Logging

Events produced by a meter's various ION modules are prioritized and grouped to facilitate custom logging. Each event is assigned a priority group number based on its type and severity.

ION Event Priority Groups

Some event groups are preset with a Priority Number as shown in the table below. You can also define your own priority number for some modules. Priority numbers from 128-191 appear in the global event log viewer in ION Enterprise software. Priority numbers from 192-255 are logged, initiate a beep and cause the window to flash. You can customize these responses to display messages or perform *netsend* messages, for example.

Event Group	Description	Priority Number
Reset	Module reset or re-synchronized	5
Setup Change	Module setup changes (setup register changes, label changes, input handle changes)	10
Input Register Change	Inputs of certain modules change value (ie, input to And/Or module changes)	15
I/O State Change	I/O state changes (ie, relay closes)	20
Information	Module produces important user information	25
Warning	Module produces a warning	30
EN50160 Event	An EN50160 Counter (N_1 or N_2) increases	50
Failure	A failure has occurred	255
Setpoint	Setpoint condition goes Active or Inactive (ie, Sag/Swell module detects a disturbance)	programmable via module setup

The Event Log Controller module allows you to set a priority cutoff for event logging. Any events with a priority number greater than the cutoff value are logged, and events with lower priorities are discarded. Refer to the individual module descriptions and the Event Log Controller module description in the *ION Reference* for more details.

External ION Events

Some events are not produced by a specific module. These events are generated internally by the meter. Their associated priority levels are shown in the table below.

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Event Group	Description	Priority Number
Warning	Factory initialize performed	30
	Firmware or memory upgrade performed	
	Meter power-up or power-down	
	Internal modem not responding or modem recovered	
	Battery low	
	Telnet or serial terminal locked out	
	Security disabled or enabled	
Failure	Communications fail to allocate required memory	255

Displaying Events

View Events in the following locations:

Application	Menu / Screen	Navigation
Front Panel	Event Log	ALT display mode
ION Setup	Event	Display Mode > Data Recorders folder > Event
Vista	Meter Events	System & Logs tab > Meter Events object
WebMeter	N/A	N/A

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Logging and Recording Capacity

The meter provides both data and event logs. The amount of memory required to store these logs depends on the number of parameters being logged and the frequency with which these parameters are logged.

The following equation can help determine the amount of memory required to store **data and event logs**:

each record consumes (in Bytes) = [(number of parameters * 5) + 8]

The meter can also perform waveform recording. It can simultaneously capture events on all channels to a maximum of 96 cycles each.

To calculate the **waveform memory** usage use the following formula:

waveform memory usage (in Bytes) = [2*(number of samples per cycle) + 10]* (number of cycles in waveform) + 30

NOTE

Round up to the next kilobyte after each of the above calculations.

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Chapter
13

Revenue

This chapter provides instructions for configuring transformer line loss compensation and time of use.

In this chapter

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  - Configuring PT/CT Correction 154
    - Using ION Setup 154
- **Transformer Line Loss Compensation (TLC) 155**
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PT/CT Correction

The primary application for PT/CT correction is to apply correction factors for ratio errors and phase angle errors to instrument transformers. Instrument transformer correction reduces or eliminates the need to replace transformers in installations where high-accuracy is required.

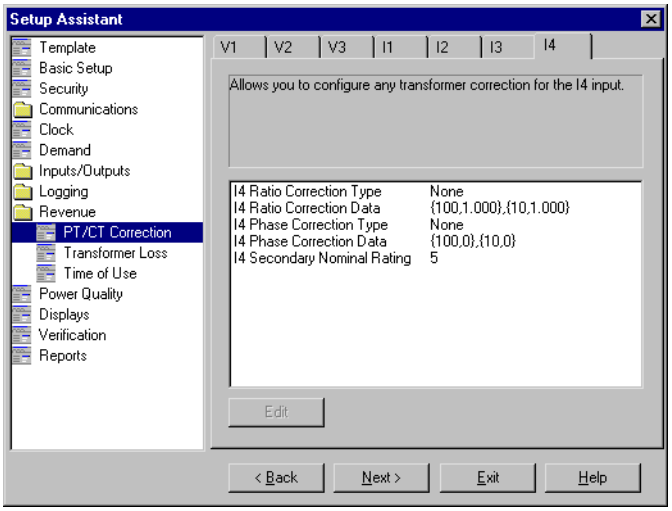
Configuring PT/CT Correction

PT/CT Correction (the *Instr Xformer* module in the meter's firmware) can be configured in the meter via ION software.

Using ION Setup

In the following ION Setup example, the PT/CT Correction Setup Assistant allows you to configure the *Instr Xformer* modules on the ION meters.

1. Open ION Setup and connect, in Basic Mode, to the desired meter.
2. Open the Revenue folder in the Setup Assistant and click PT/CT Correction.
3. For each desired tab, select the Correction Type, and input the Ratio Correction Test Data and the Phase Correction Test Data points.



NOTE

You may select a maximum of eight (8) test points.

The Instrument Transformer Correction module is a core module; there is an ITC module for each current input (I1, I2, I3, I4) and for each voltage input to the meter (V1, V2, V3). Note that the correction affects only the 1-second values in the Power Meter module. No high-speed, harmonics, or waveform values are affected by the correction. For more information, see the ITC (*Instr Xformer)* module description in the online *ION Reference*.

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Transformer Line Loss Compensation (TLC)

Transformer Loss Compensation is used when a meter's actual location is different from the electrical location where change of ownership occurs; for example, where meters are connected on the low-voltage side of power transformers when the ownership change occurs on the high-side of the transformer. This physical separation between meter and actual billing point results in measurable losses. Compensating for this loss - Loss Compensation - is the means of correcting this meter reading. Losses may be added to or subtracted from the meter registration.

Meters are usually installed on the low-voltage side of a transformer because it is more cost-effective. There are also cases where change of ownership may occur halfway along a transmission line where it is impractical to install a meter. In this case, power metering must again be compensated.

⚠ CAUTION

Due to the variation in installations, **advanced knowledge of power systems and connection methods is required before transformer loss compensation can be properly implemented.** Data parameters should only be programmed by qualified personnel that have appropriate training and experience with Transformer Loss Compensation calculations.

For more information, see the latest version of the *Transformer Line Loss Compensation* technical note.

Configuring TLC

Use ION software to change your meter's TLC settings.

Using the Front Panel

You cannot configure Transformer Line Loss Compensation using the front panel.

Using ION Setup

The Revenue Setup Assistant helps you configure TLC. The Transformer Loss screen allows you to enable/disable TLC, choose which method you prefer (1 or 2) and configure TLC settings.

1. Open ION Setup and connect to your meter, using Basic Mode.
2. In the Setup Assistant, navigate to Revenue > Transformer Loss

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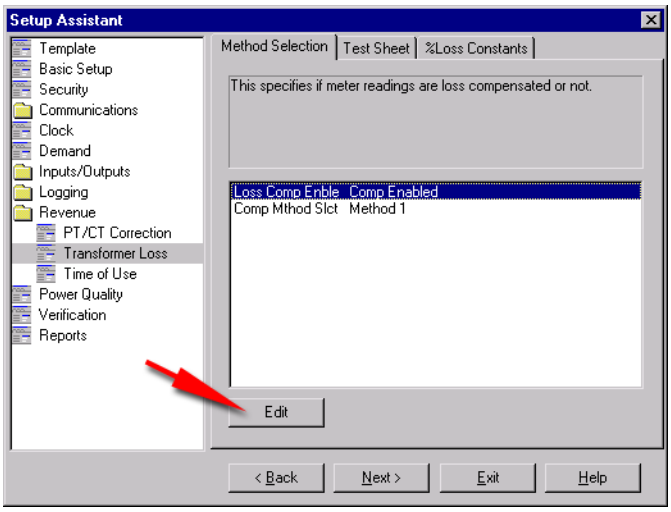
3. First, enable TLC by selecting Loss Comp Enble and clicking the Edit button.



4. Select Comp Enabled from the drop-down list and click OK.
5. Next choose the TLC method you wish to use by selecting Comp Mthod Slct and clicking the Edit button.

   Select Method 1 to use the Test Sheet method and Method 2 to use the %Loss Constants method.
6. Finally, click the tab of the TLC method you chose in the previous step and configure the settings for that method.

Using Vista

Click the Loss Compensation button in the Revenue screen to access the Loss Compensation screen:

1. Launch Vista.
2. In the User Diagram screen that appears, click the Revenue button.

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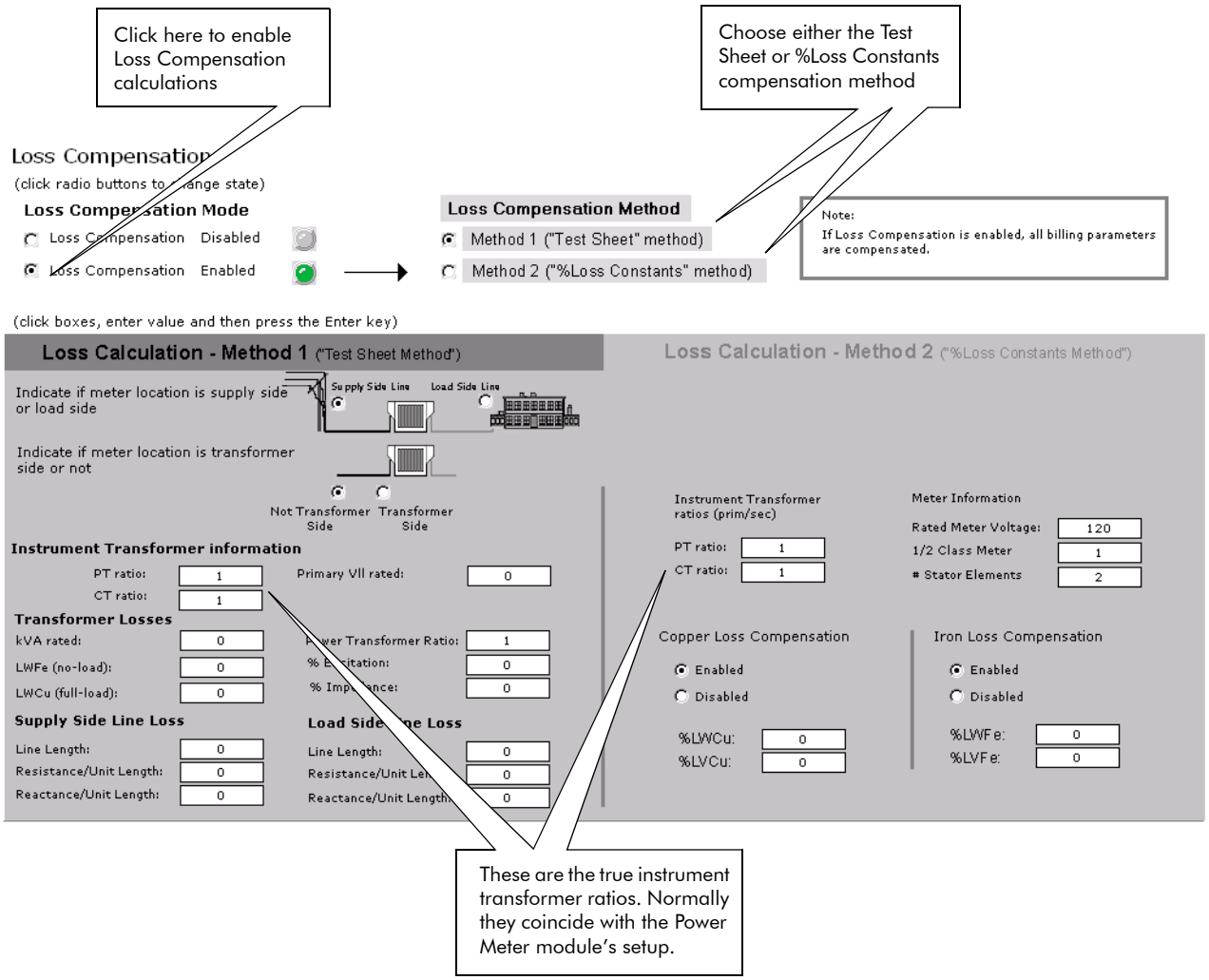
3. Click the Loss Compensation button. The following window appears:


Click here to enable Loss Compensation calculations
Choose either the Test Sheet or %Loss Constants compensation method
Loss Compensation
(click radio buttons to change state)
Loss Compensation Mode
Loss Compensation Disabled
Loss Compensation Enabled
Loss Compensation Method
Method 1 ("Test Sheet" method)
Method 2 ("%Loss Constants" method)
Note:
If Loss Compensation is enabled, all billing parameters are compensated.
(click boxes, enter value and then press the Enter key)
Loss Calculation - Method 1 ("Test Sheet Method")
Loss Calculation - Method 2 ("%Loss Constants Method")
Indicate if meter location is supply side or load side
Supply Side Line
Load Side Line
Indicate if meter location is transformer side or not
Not Transformer Side
Transformer Side
Instrument Transformer information
PT ratio: 1
CT ratio: 1
Primary Vll rated: 0
Transformer Losses
kVA rated: 0
LWFe (no-load): 0
LWCu (full-load): 0
Power Transformer Ratio: 1
% Excitation: 0
% Impedance: 0
Supply Side Line Loss
Line Length: 0
Resistance/Unit Length: 0
Reactance/Unit Length: 0
Load Side Line Loss
Line Length: 0
Resistance/Unit Length: 0
Reactance/Unit Length: 0
Instrument Transformer ratios (prim/sec)
PT ratio: 1
CT ratio: 1
Meter Information
Rated Meter Voltage: 120
1/2 Class Meter 1
Stator Elements 2
Copper Loss Compensation
Enabled
Disabled
%LWCu: 0
%LVCu: 0
Iron Loss Compensation
Enabled
Disabled
%LWFe: 0
%LVFe: 0
These are the true instrument transformer ratios. Normally they coincide with the Power Meter module's setup.

4. Configure your values as required.

See the *Transformer Loss Compensation* technical note for more details on this feature.

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Time of Use

The Time of Use module may only be important if you are using the meter in a billing application (i.e. you are a power provider), as the module contains the meter's seasonal rate schedules. Typically, power consumers do not require Time Of Use configuration.

See the *ION Reference* for more information on the Time of Use module.

Configuring Time of Use

Use ION software to change your meter's Time of Use settings.

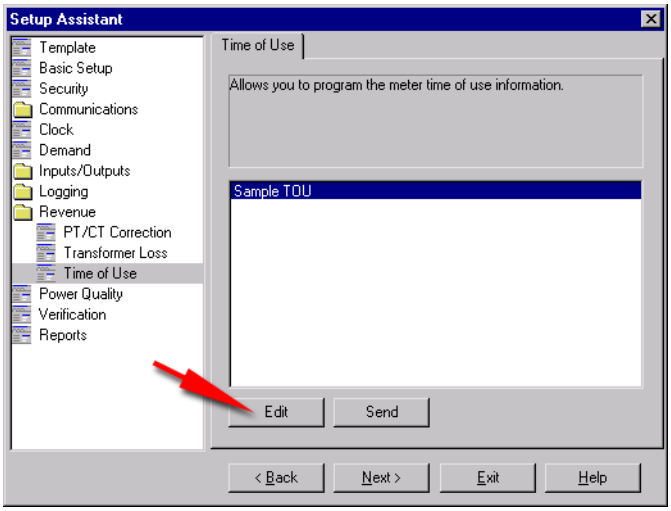
Using the Front Panel

You cannot configure Time of Use using the front panel.

Using ION Setup

The Time of Use Setup Assistant helps you configure the Time of Use module.

1. Open ION Setup and connect to your meter, using Basic Mode.
2. In the Setup Assistant, navigate to Revenue > Time of Use



3. Select a Time of Use program from the list (in this example, Sample TOU) and click Edit.
4. Follow the Time of Use Wizard to configure your program. Click Send to save the TOU program on your meter.

Using Designer

Open your meter in Designer and navigate to the Time-of-Use Setup Framework. Right-click the Time of Use module to edit.

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Time Of Use Module Settings

The Time of Use module's setup registers define your seasons' start and end dates, the day types where your rates may differ, and the rate schedules for each season's day types. The module compares the meter's internal clock with the season, day, and time of day settings in these registers, and changes its output registers to reflect the current state of these settings.

Seasonal Settings

The Time of Use module supports up to four separate seasons. Each seasons' start and end dates are set into the appropriate *Season* setup register.

NOTE

Ensure that there is no date overlapping when defining seasons and that every day of the year is covered by your seasons. If there are gaps between seasons, the module returns an error and will not function.

If your rates do not change between seasons, you do not need to configure the *Season* setup registers — Season 1 is the default, and all Season 1 rates are in effect all year.

If you have different seasons, enter their start and end dates into the appropriate setup registers. If your season is active on the same dates every year, you only need to enter a single range of dates in the appropriate *Season* setup register. If the active dates are different each year (for example, Season 3 becomes active every first Monday in August), the start dates must be individually specified for each year.

The Time of Use module is partially configured at the factory. Check the setup registers to ensure that the settings match your Time of Use schedules.

Setup Register	Function
Season 1- 4	These setup registers define the dates for each active season. When a season is active, the Time of Use module will use the applicable rate schedules.
Season 1 - 4 Weekday Rates	These setup registers specify seasonal weekday rates.
Season 1 - 4 Weekend Rates	These setup registers specify seasonal weekend rates.
Season 1 - 4 Alt 1 Rates	These setup registers specify a season's daily rates during the days specified in the Alt 1 Days setup register.
Season 1 - 4 Alt 2 Rates	These setup registers specify a season's daily rates during the days specified in the Alt 2 Days setup register.
Season 1 - 4 Holiday Rates	These setup registers specify a season's daily rates during the days specified in the Holidays setup register.
Weekdays	This register defines the days of the week for all seasons. The rates in the Season (1, 2, 3, or 4) Weekday Rates setup registers are used on these days.
Weekends	This register defines the weekend days for all seasons. The rates in the Season (1, 2, 3, or 4) Weekend Rates setup registers are used on these days.

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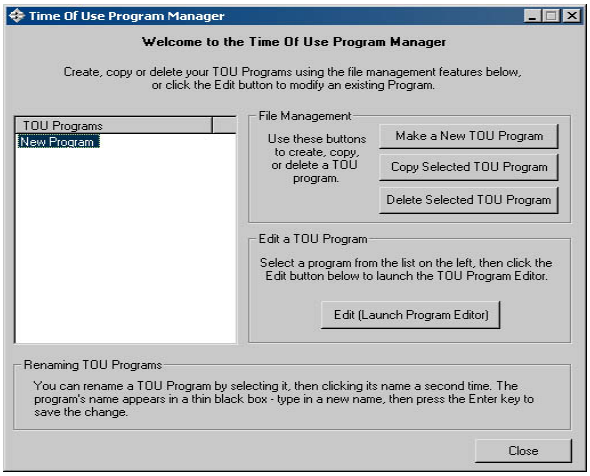
Setup Register	Function
Alt 1 Days	This register defines a set of alternative dates for all seasons. These dates generally have different rates from weekdays, weekends, or holidays.
Alt 2 Days	This register is similar in function to Alt 1 Days, but contains a different set of dates.
Holidays	This register defines the holidays for all seasons. The rates defined in the Season (1, 2, 3, or 4) Holiday Rates setup registers are used on these days.
Self Read Days	This setup register defines the dates and times that the Self Read output register will pulse. If no time is entered in this register, the Self Read output register will pulse on the date specified at 12:00 AM.

Creating a New Time Of Use Schedule

You can create a new TOU schedule using the TOU Program Manager; the program is a self-documented, graphical wizard. You launch the TOU Program Manager in Designer from the Options menu.


Time Of Use Program Manager
Welcome to the Time Of Use Program Manager
Create, copy or delete your TOU Programs using the file management features below, or click the Edit button to modify an existing Program.
TOU Programs
New Program
File Management
Use these buttons to create, copy, or delete a TOU program.
Make a New TOU Program
Copy Selected TOU Program
Delete Selected TOU Program
Edit a TOU Program
Select a program from the list on the left, then click the Edit button below to launch the TOU Program Editor.
Edit (Launch Program Editor)
Renaming TOU Programs
You can rename a TOU Program by selecting it, then clicking its name a second time. The program's name appears in a thin black box - type in a new name, then press the Enter key to save the change.
Close

Displaying Time of Use

View Time of Use values in the following locations:

Application	Menu	Navigation
Front Panel	Active TOU Rate and Active TOU Season screens	ALT Display mode
ION Setup	N/A	N/A
Vista	Time of Use Screen	Revenue tab > Time of use object
WebMeter	N/A	N/A

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Chapter
14

Power Quality

This chapter explains how to configure your meter's power quality functionality.

In this chapter

- **Introduction** **162**
- **Configuring Power Quality** **162**
  - Using the Front Panel 162
  - Using ION Setup 162
  - Using Designer 163
  - Sag/Swell Module Settings 163
  - Transient Module Settings (ION8600A only) 164

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Introduction

Power quality configuration is provided by a number of modules, depending on your meter type: the Sag/Swell module, the Transient module, and the Mains Signalling Evaluation module, among others.

See the *ION Reference* for more information on these modules.

Configuring Power Quality

Use ION software to change your meter's power quality settings.

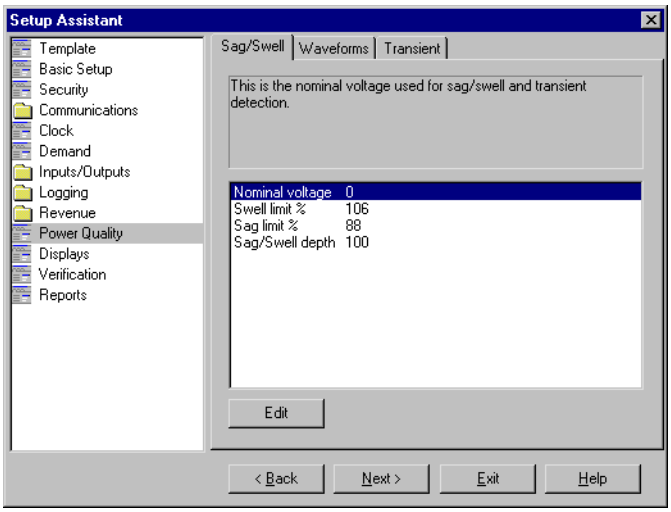
Using the Front Panel

You cannot configure Power Quality from the front panel.

Using ION Setup

The Power Quality Setup Assistant helps you configure the various power quality modules.

1. Open ION Setup and connect to your meter, using Basic Mode.
2. In the Setup Assistant, navigate to the Power Quality folder.



3. Click on the Sag/Swell tab to set sag and swell limits, configure sag/swell waveform recorder settings and most importantly, record your system's nominal voltage.
4. Click on the Waveforms tab to configure the waveform recording features of the meter, including the waveform depth, the number and samples per cycle.
5. Click on the Transient tab to configure various settings such as voltage deviation threshold and transient waveform recorder depth and frequency.

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NOTE

The ION8600A features dual waveform capture: Sags are recorded at 32 samples x 54 cycles. Transients waveform capture at 256 samples x 7 cycles.

Using Designer

Open your meter in Designer and navigate to the Power Quality Setup Framework. Right-click a module to edit.

Sag/Swell Module Settings

The Sag/Swell module monitors voltage waveforms for sags and swells (i.e. ITI [CBEMA] Type 2 and Type 3 disturbances). It then reports each disturbance's magnitude and duration. The Sag/Swell module can also detect sub-disturbances during a Sag/Swell event. Settings are as follows:

Setup Register	Function	Default
Swell Lim	This is the magnitude above which a voltage deviation is considered a swell.	106
Sag Lim	This is the magnitude below which a voltage deviation is considered a sag.	88
Change Crit	This is the amount a voltage signal must change during a disturbance to be considered a new sub-disturbance.	10
Nom Volts	This is the nominal power system voltage (used for all Power Quality functions).	0 [1]
EvPriority	The priority assigned to Sag/Swell and Transient module events (0 to 255, 255 is highest).	200

[1] The primary power system voltage is sometimes different than the PT Primary setup register value (i.e. when the PT Primary is used to indicate winding ratio rather than primary voltage).

Besides *NomVolts*, the only setup registers that you may need to change in the Sag/Swell module are *Swell Lim* and *Sag Lim*. Most applications are served by the default values entered into these registers. The *Change Crit* and *EvPriority* setup registers do not need to be changed for normal operation.

NOTE

If the Sag/Swell module's *Nom Volts* setup register is set to zero, all Sag/Swell module functions are disabled. *Nom Volts* is typically set when the meter is put into service. If *Nom Volts* has not been set, enter a value for your system's nominal voltage (i.e. 120, 277, or 347). The value you enter will also be used by the Transient module in the ION8600A.

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Transient Module Settings (ION8600A only)

The Transient module monitors voltage waveforms for transient activity (i.e. ITI [CBEMA] Type 1 disturbances). The *Threshold* setup register defines what voltage disturbance magnitude should be considered as transient activity. *Threshold* is interpreted as a percentage of the nominal system voltage, plus 100. For example, if you want transients recorded when voltage deviates from nominal by 20%, enter 120 into the *Threshold* setup register.

Setup Register	Function	Default
Threshold	This is the magnitude at which a voltage deviation is considered a transient.	125
EvPriority	The priority assigned to Sag/Swell and Transient module events (0 to 255, 255 is highest).	200

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Chapter
15

Displays

This chapter explains the available front panel displays. It also includes procedures for customizing displays using ION software.

In this chapter

- **Introduction** **166**
- **Configuring Front Panel Displays** **167**
  - Using the front panel 167
  - Using ION Setup 167
  - Using Designer 168
- **Default Front Panel Display Screens** **171**
  - NORM mode display screens 171
  - ALT mode default display screens 172
  - TEST mode default display screens 175

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Introduction

The ION8600 ships with pre configured display screens designed to suit the data needs of most users. Different types of screens are available depending upon the meter's current mode of operation (see "Modes of Operation" on page 27 for details).

Front panel displays may also be customized on your meter to show virtually any measurement or calculation. For example, you could do one or all of the following:

- change displayed parameters, such as from *Vll* to *Vln* or *Vllab* to *Vlna*
- adjust character size to be different on each screen
- change data display settings such as backlight timeout, automatic display scrolling, parameter update rate and display mode*

Use ION software to customize your front panel display screens.

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Configuring Front Panel Displays

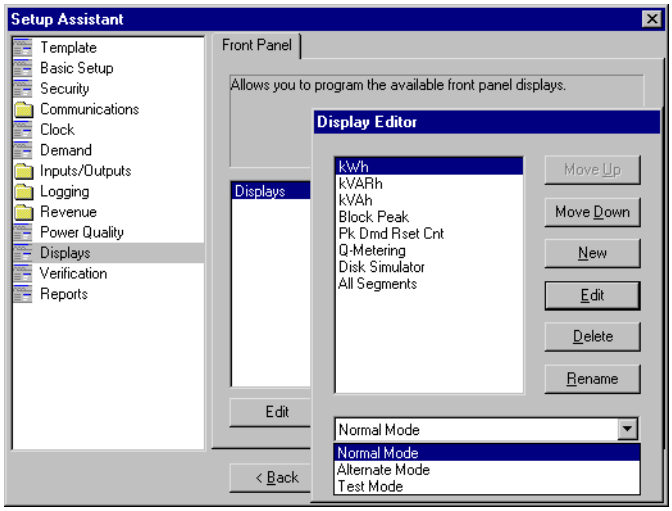
Using the front panel

You cannot configure displays from the front panel.

Using ION Setup

1. Open ION Setup and connect, in basic mode, to the appropriate meter.
2. In the Setup Assistant, navigate to Displays and click Edit.

   ION Setup will upload your meter's display information to the Display Editor. This may take a few moments.



3. Edit, rename, delete or rearrange displays as desired.
4. If you choose to edit or create new display, the Display Editor wizard contains three steps for creating or editing display screens.

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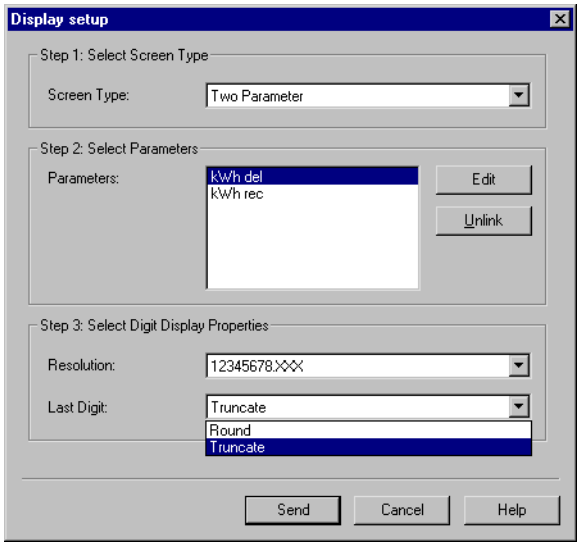

- Choose the screen type
- Select the parameters available for your chosen screen type
- Select your display qualities, including digit resolution and truncated or rounded last digits.

5. Click Send to save the changes in the meter.

Using Designer

⚠ CAUTION

Before you reconfigure or delete a framework, you should make a copy. This ensures that you can restore the framework without having to reinitialize the factory configuration.

To remove a data display screen:

1. Launch Designer.
2. Select the Display module responsible for the screen.
3. Press delete. This also deletes all links to that particular Display module.

If the display screen you are deleting is part of the automatic scrolling cycle, you should reconfigure the links from the Scroll module's *Trigger* outputs to the remaining Display modules so that the following considerations hold true:

- The first Display module in the scrolling cycle is linked to the *Trigger 1* output of the Scroll module.
- The last Display module in the scrolling cycle (module *n*) is linked to the *Trigger n* output of the Scroll module. For example, if your scrolling cycle consists of 5 screens, then *Trigger 5* should be linked to the fifth module in the cycle.
- The *Wraparound* setup register of the Scroll module designates the last trigger output (*Trigger n*). Expanding on the previous example, since *Trigger 5* is the last trigger, the Scroll module's *Wraparound* setup register would have a value of 5.

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To add a new display screen

1. Create a Display module.
2. Define the modules characteristics (display format) by adjusting its setup registers.
3. Link any required data to the *Source* inputs of the Display module.

If you want your new screen to appear in the automatic scrolling cycle, then you must link the *Show* input of the Display module to a *Trigger* output of a Scroll module.

To create a Disk Simulator screen

1. Create a new Display module, and choose the type as *Disk Simulator*.
2. Connect the new Display module's first input to the Calibration Pulser module's *Disk Position* output that you want to monitor for its pulsing interval.
3. To include the newly added screen to the ALT screen list, connect the Display module's *Show1* and *Show2* inputs to the Scroll module's last available *Trigger* outputs in ALT SCROLL UP and ALT SCROLL DOWN (respectively).

   You can determine the last available *Trigger* by right-clicking on the output to discover the *Triggers'* owners.
4. Increase the Scroll module's *Wraparound* setup register by 1 to include the new screen.
5. Configure the remaining display settings according to your needs.

Although the Disk Simulator display is intended to show the disk behavior of mechanical watt-hour meters, this feature can be used to monitor any accumulated meter quantity over the time. To do this, connect the Display module's first input to the meter quantity, and connect the second input to the maximum value that you expect the displayed quantity to be bounded by (this could be any ION output register or an *External Numeric* module register). In this case, (i.e. the Display module is *not* connected to a Calibration Pulser module) the Disk Simulator revolves from left to right.

NOTE

The inputs to the Disk Simulator display are always positive. If the value exceeds the maximum scale value assigned in the second input, then nothing is displayed except labels and the disk rectangle.

To configure leading zeros

The leading zeros and decimal point in a numeric display can be configured with the Display module setup register *Screen Resolution*. For example, the number 276.3443 can be configured in one of the following ways, depending on the selection you make in the *Screen Resolution* setup register:

Value	Screen Resolution		
276.3443	1.x	=	276.3
	1234.xx	=	0276.34
	123456.	=	000276.

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If the *Screen Resolution* setup register is set to DEFAULT, the Display module will use the resolutions defined in the Display Options module.

Last digit mode

The Display module setup register *Last Digit Mode* lets you specify whether to truncate or round a value's last digit. Numbers round up at 5 or greater, and round down from 1 to 4. A truncated value disposes of any digits after the number of decimal places that you have specified in the *Screen Resolution* setup register.

Screen Resolution = 1.xxx

Value	=	276.35192
Rounded	=	276.352
Truncated	=	276.351

To configure parameter titles

The parameter value on a display screen is the value of an output connected to the Display module *Source* input register. By default, the displayed parameter's title is the name of the output connected to the *Source* input. The Display module *Source Title* setup register lets you change the default to a title that better describes your system. For example, if "KWh Net" is linked to the first *Source* input, you could change its display name by setting *Source 1 Title* to "KWh Net West." A maximum of 25 characters is permitted.

See "Changing TEST Mode Timeout" on page 182 for information on configuring TEST mode display timeouts.

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Default Front Panel Display Screens

Each mode of operation (NORM, ALT and TEST) has its own display screens, providing various power system data and meter properties screens.

NORM mode display screens

The factory-configured ION8600 meter scrolls through nine displays detailed below. If the settings in the Scroll module have not been altered, each screen is displayed for five seconds if no front panel buttons are pressed.

Display scrolling is suspended when a front panel button is pressed, and you can manually scroll through the display screens using the Up or Down arrow buttons. If required, refer to "Front Panel Features" on page 20 for more instructions on using the front panel buttons.

1. kWh

   This screen displays kWh delivered and received values.

2. kVARh

   This screen displays kVARh delivered and received values.

3. kVAh

   This screen displays kVAh delivered and received values.

4. Peak Demand Delivered

   This screen displays the maximum delivered kW value and a timestamp of when the peak occurred. This value is a Sliding Window (Rolling Block) demand calculation.

5. Peak Demand Received

   This screen displays the maximum received kW value and a timestamp of when the peak occurred. This value is a Sliding Window (Rolling Block) demand calculation.

6. Peak Demand Reset Count

   This screen displays a count of the number of Demand Resets executed as well as a timestamp of the latest Peak Demand Reset.

7. Q Metering

   This screen displays approximated VARh measurements, one phase (60 degrees) behind the normal watthour connection (90° - 330° and 150° - 270°).

8. Disk Simulator

   This display simulates the behavior of a mechanical watt-hour meter indicating power received or delivered by the direction of the pulse.

9. All Segments

   This is a screen test where a black screen showing all segments (all pixels on) indicates that the display is functioning properly.

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ALT mode default display screens

The factory-configured ION8600 meter scrolls through the following ALT mode displays. If the settings in the Scroll module have not been altered, each screen is displayed for five seconds if no front panel buttons are pressed (until five minutes have elapsed).

Viewing ALT display modes

1. Press the **Alt/Enter** button once to toggle between the NORM and ALT display modes.
2. Press the **Up** or **Down** arrow buttons to scroll back or forth through the displays.

If no buttons are pressed the meter reverts back to NORM mode after five minutes.

NOTE

These screens vary depending on the firmware version on the meter and custom display configuration.

1. Name Plate 1

   The Name Plate 1 screen contains this information:

   - Owner
   - TAG1 from Factory module
   - TAG2 from Factory module
   - Firmware revision of the meter
   - Battery life indicator

   TAG1 and TAG2 typically identify the meter's user and installed location. The Owner and TAG registers are configurable with ION software. See "How to TAG Your Meter" on page 42.

2. Name Plate 2

   This screen displays the following information for the current Sliding Window (Rolling Block) and Thermal demand settings:

	Sliding Window (Rolling Block)	Thermal
CONFIG	Length of the demand period multiplied by the number of demand periods	Length of the demand period
UPDATE	Length of the demand period	Always 1 second
SYNC	Clock synchronization source	Always N/A
MAX (kW)	Maximum kW Demand[1]	Maximum kW Demand[1]

1 The MAX (kW) value is a maximum allowable demand level based on installed transformer configurations and nominal voltages and currents.

3. Event Log

   The Event Log screen displays up to four most recent, highest priority events (priority 255 only). The date, a timestamp, an event description, and an event code are provided for each event displayed. If more than four high priority

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events have been recorded, then the Event Log screen will indicate additional logs exist. Refer to "Data Logging" on page 142 for more details.

4. Vector Diagram

   This screen shows phasors and numeric values for each phase current and phase voltage measurement.

5. Instantaneous Voltage

   This screen shows average voltage, line-to-neutral and/or line-to-line voltage (depending on the meter's service type).

6. Instantaneous Current

   This screen shows the phase current and average current values.

7. Instantaneous Power

   This screen shows kW total, kVAR total, kVA total and signed Power Factor total values.

8. Instantaneous Demand

   This screen shows kW delivered and received from the Sliding Window (Rolling Block) demand calculation.

9, 10, 11. Voltage Harmonics

   These screens show histograms of the per phase voltage harmonic content.

12, 13, 14. Current Harmonics

   These screens show histograms of the per phase current harmonic content.

15. Availability

   This screen shows the availability of power in a "number of nines" measurement, over a pre-set period of time.

16. Instantaneous Demand

   This screen shows kW td delivered and received.

ALT mode Time of Use (TOU) display screens

ALT mode display screens 17 to 56 are factory-configured to show Time of Use (TOU) data. The measurements displayed originate from frameworks of ION modules that are linked to a TOU module. For details about the TOU module, refer to the *ION Reference*.

By default, all demand values result from Sliding Window (Rolling Block) calculations.

17. TOU Energy by Rate

   This screen shows kWh delivered values for each TOU rate.

18 - 25. kW Peak Demand

   These screens display the maximum kW delivered value for each TOU rate. These values result from Sliding Window (Rolling Block) demand calculations.

26. Previous Billing Energy

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This screen displays the kWh delivered values for each TOU rate in the previous billing period.

NOTE

PB = Previous Billing period. A billing period is the time between two consecutive meter readings for billing purposes by a utility.

27 - 34. Prev Billing Peak Demand

These screens display the maximum kW delivered value for each TOU rate in the previous billing period. These values result from Sliding Window (Rolling Block) demand calculations.

35. Previous Season Energy

This screen displays the kWh delivered for each TOU rate in the previous billing season. These values result from Sliding Window (Rolling Block) demand calculations.

NOTE

PS = Previous Season. Billing Seasons are defined in the TOU module description in the ION Reference.

36 - 43. Prev Season Peak Demand

These screens display the maximum kW delivered for each TOU rate in the previous billing season.

44. Prev Billing/Season Energy

These screens display the kWh delivered and received values in the previous billing period and billing season.

45, 46. Prev Bill/ Season Pk Demand

These screens show the maximum kW sd received values in the previous billing period and billing season. These values result from a Sliding Window (Rolling Block) demand calculation.

47. Prev Billing/Season Energy

These screens display the kVARh delivered and received values in the previous billing period and billing season.

48, 49. Prev Bill/Season Pk Demand

These screens display the kVAR delivered and received values in the previous billing period and billing season. These values result from a Sliding Window (Rolling Block) demand calculation.

50. Prev Billing/Season Energy

These screens display the kVAh delivered and received values in the previous billing period and billing season.

51, 52. Prev Bill/Season Pk Demand

These screens display the kVA delivered and received values in the previous billing period and billing season. These values result from a Sliding Window (Rolling Block) demand calculation.

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53. Active TOU Rate

    This screen shows which of the valid TOU billing rates is active.

54. Active TOU Season

    This screen shows which TOU billing season is currently active.

55. Flicker

    This screen displays flicker measurements from V1, V2 and V3.

56. Frequency

    This screen displays frequency information.

TEST mode default display screens

Recall that the values shown in the TEST mode display screens represent different accumulators than those shown in NORM mode (although they perform some of the same basic measurements). The TEST mode display values are for calibration checking purposes; they will only accumulate while the meter is in TEST mode.

Viewing TEST mode

There are two ways to switch the meter into TEST mode depending on the type of meter you have:

- Standard meter (without hardware lock): You must use ION software; refer to "Switching to TEST Mode" on page 179.
- Standard hardware-locked meter: You must remove the cover from the meter and press the TEST mode button; refer to "Remove the socket-sealing ring (if applicable)." on page 186 for detailed instructions on removing the meter's cover.

Once the meter is in TEST mode the front panel cycles through four TEST mode display screens summarized below.

1. kWh Test

   This screen shows TEST mode kWh delivered and received values.

2. kVARh/KVAh Test

   This screen shows TEST mode kVARh/KVAh delivered and received values.

3, 4. Instantaneous Demand Test

   This screen shows TEST mode kW delivered and received values. Both quantities are produced from a Sliding Window (Rolling Block) demand calculation. This value is reset if the Demand Reset switch is turned while the device is in TEST mode.

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Chapter
16

TEST Mode

This chapter describes your meter's TEST Mode and explains how to switch from Normal Mode to TEST Mode.

In this chapter

- **Introduction** **178**
- **Switching to TEST Mode** **179**
  - Using the front panel (standard meter) 179
  - Using the front panel (hardware locked meter) 179
  - Using ION Setup (standard meter) 179
  - Using ION Setup (hardware-locked meter) 180
  - Using Vista (standard meter) 180
  - Using Vista (hardware-locked meter) 181
- **Changing TEST Mode Timeout** **182**
  - Using the front panel 182
  - Using ION Setup 182
  - Using Designer 183
- **TEST Mode Default Display Screens** **184**
  - TEST mode LED energy pulsing 184

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Introduction

TEST Mode is typically used for verifying meter calibration and function. The meter is usually reading data from a test power supply while these functions are performed.

Several things to note about TEST Mode:

- All of the billing quantities that are recorded when the meter is in normal mode will stop accumulating when the meter is switched to TEST Mode — the data is sent to special TEST Mode registers instead.
- The values accumulated in these test registers are displayed on the front panel and in ION software.
- The regular normal mode billing registers are unaffected while the meter is in TEST Mode; accumulation of this data continues as soon as you exit TEST Mode.
- All test registers are reset to zero when you exit TEST Mode.

NOTE

The meter will always return to NORM mode when you exit TEST mode, even if you entered TEST mode from ALT mode.

You cannot place a hardware-locked meter in TEST mode using ION software. The meter must be placed in TEST mode via the front panel.

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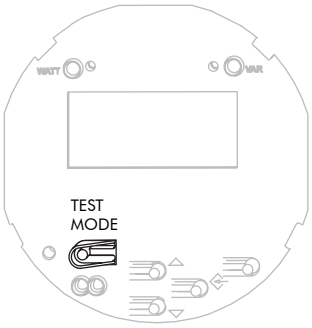
Switching to TEST Mode



Place the meter into TEST Mode using the front panel, ION Setup or Vista. The meter's front panel informs you when the meter is in TEST Mode with a special display screen.

Using the front panel (standard meter)

The TEST mode button on the ION8600 meter is located beneath the outer cover. You must first remove the cover. Refer to the procedure for removing this cover on page 186.

Once you have removed the outer cover, press the TEST mode button.

Using the front panel (hardware locked meter)

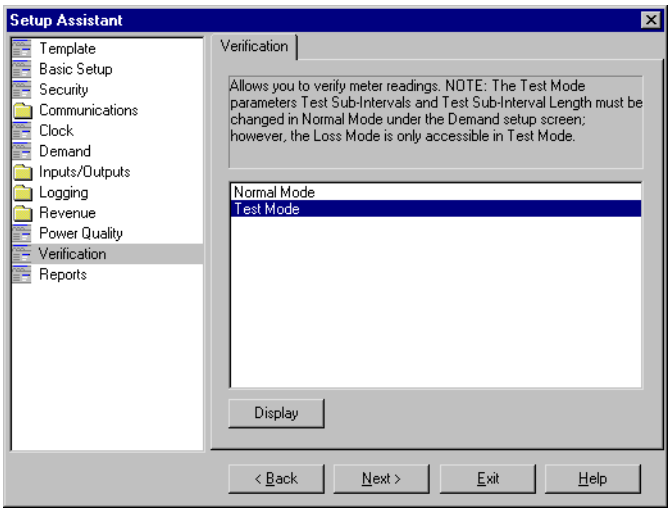
Hardware-lockable meters must be in TEST mode before they can be configured.

To place the meter in TEST mode, remove the outer cover following the procedures listed on page 186.

The regular NORM/ALT mode billing registers are unaffected while the meter is in TEST mode; accumulation of this data continues as soon as you exit TEST mode. All test registers are reset to zero when you exit TEST mode.

Using ION Setup (standard meter)

1. Open ION Setup and connect to your meter, using Basic Mode.
2. In the Setup Assistant, navigate to the Verification folder.



3. Click on TEST Mode. If meter security is enabled, you will be prompted for password. A dialog box informs you the meter is in TEST Mode.

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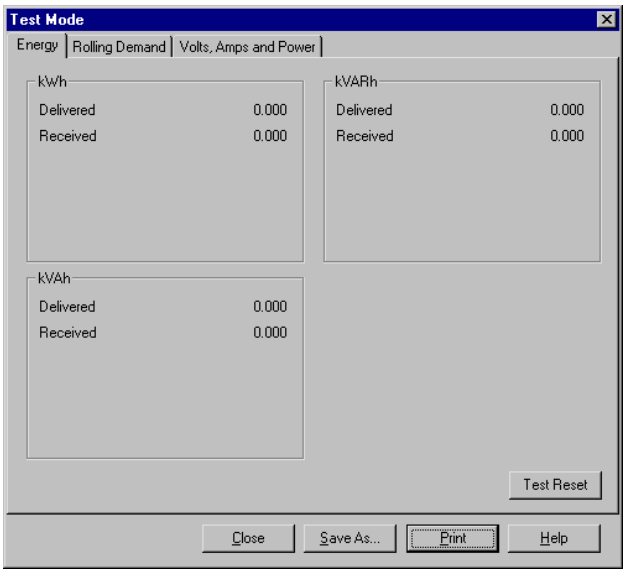
4. Click OK. The TEST Mode screen appears and test values are displayed.



Click on the tabs to perform various test-related tasks. See the ION Setup online help for more information.

5. Click Close. A dialog box informs you the meter is back in Normal Mode.

Using ION Setup (hardware-locked meter)

You cannot place a hardware-locked meter in TEST mode using ION software. The meter must be placed in TEST mode via the front panel. See “Switching to TEST Mode” on page 179.

Using Vista (standard meter)

1. Open the meter in Vista.
2. Navigate to Revenue and click the Setup & Controls button in the bottom right-hand corner of the revenue screen.

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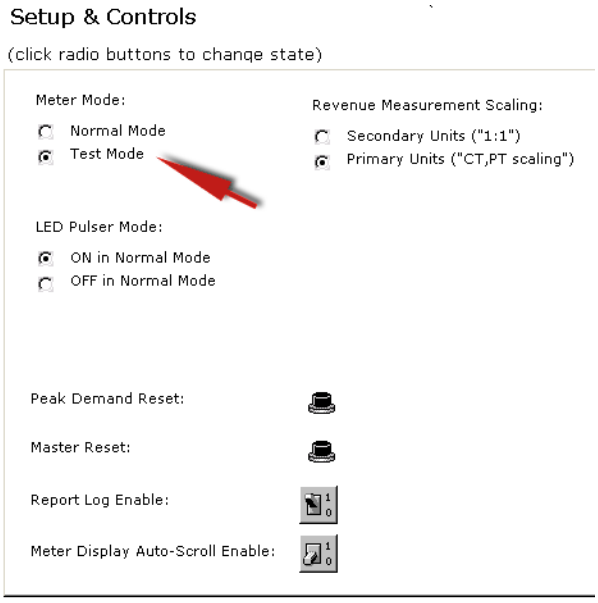
3. Select the TEST Mode radio button. You will be prompted for the ION Enterprise user password. If meter security is enabled, you will also be prompted for the meter password.



Use this screen to view and reset the registers that accumulate real-time data. For more information see the Vista section of the online *ION Enterprise Help*.

Using Vista (hardware-locked meter)

You cannot place a hardware-locked meter in TEST mode using ION software. The meter must be placed in TEST mode via the front panel. See “Switching to TEST Mode” on page 179.

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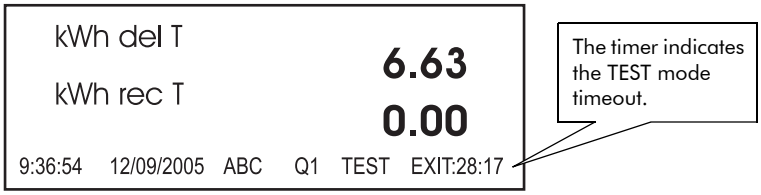
Changing TEST Mode Timeout

If no front panel buttons are pressed, the meter will exit TEST mode after 30 minutes (unless the default TEST mode timeout value has been changed). While in TEST mode, the value on the bottom right of the status bar indicates the amount of time before TEST mode times out. The meter always returns to NORM mode when the TEST mode time-out elapses.



The time-out value resets to 30 minutes each time you press any front panel button. By default the TEST mode time-out value is 30 minutes.

You can change the value of the TEST mode time-out using ION software or the front panel.

Using the front panel

Follow these steps if you are using the front panel:

NOTE

You must be in TEST mode to change the TEST mode time-out if you have the hardware-lockable meter.

1. Enter the Setup menu by holding down the Alt/Enter button.
2. Scroll through the menu items, highlight DISPLAY OPTIONS, and press the Alt/Enter button.
3. Scroll down and highlight the TEST MODE TO menu item. Press Alt/Enter.
4. The current TEST mode time-out is displayed. Use the Up or Down arrow buttons to change the value of the highlighted digit. Press the Up or Down arrow button to change the position of the highlight cursor. When you have entered the new value of the TEST mode time-out in seconds, press the Alt/Enter button.
5. Select YES to Confirm the change, and enter the meter password if required.

Using ION Setup

Follow these steps if you are using ION Setup:

1. Start ION Setup and connect to the desired meter in Advanced Mode.
2. Locate the Display Options module in the module list and double-click to open the module.
3. In the Display Options module, click the Setup Registers tab and double-click the *TEST Mode Timeout* setup register. The default setting for this setup register is 1800 seconds (30 minutes).

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4. Set the TEST Mode timeout to the desired time. You can choose from a numeric bounded format or an elapsed interval format.
5. Click SEND to transmit the changes to the meter.

Using Designer

Follow these steps if you are using Designer:

1. Open Designer and connect to the desired meter.
2. Double-click the Display Setup folder on the Designer screen.
3. Right-click on the Display Options module to access the setup registers. Select the *TEST Mode Timeout* setup register and click Modify to edit.
4. Set the TEST Mode timeout to the desired time. You can choose from a numeric bounded format or an elapsed interval format.
5. Click OK to send the changes to the meter.

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TEST Mode Default Display Screens

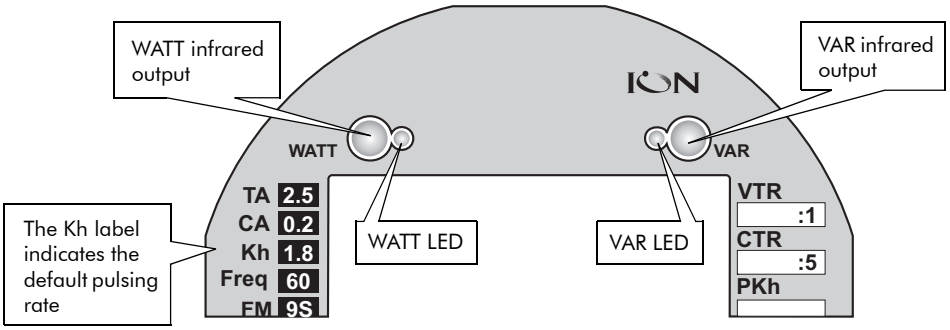
Recall that the values shown in the TEST mode display screens represent different accumulators than those shown in NORM mode (although they perform some of the same basic measurements). The TEST mode display values are for calibration checking purposes; they will only accumulate while the meter is in TEST mode.

Once the meter is in TEST mode the front panel cycles through four TEST mode display screens:

- 1. kWh TEST
  - This screen shows TEST mode kWh delivered and received values.
- 2. kVARh/KVAh TEST
  - This screen shows TEST mode kVARh/KVAh delivered and received values.
- 3, 4. Instantaneous Demand TEST
  - This screen shows TEST mode kW delivered and received values. Both quantities are produced from a Sliding Window (Rolling Block) demand calculation. This value is reset if the Demand Reset switch is turned while the device is in TEST mode.

TEST mode LED energy pulsing

- Above the display screen are two pairs of energy pulsing LEDs and infrared outputs. The LEDs and IR outputs are factory-configured to pulse while the meter is in TEST mode.



The energy pulsing LEDs provide an ideal interface for calibration checking instruments. The Kh label (to the left of the display screen) indicates the factory-configured pulsing rate. (You can change the energy pulsing frequency with ION software.) Refer to "TEST mode" on page 32 for more information about using TEST mode.

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Chapter
17

Resets

This chapter provides instructions for performing various meter resets.

In this chapter

- **Performing a Reset 186**
  - Using the Front Panel 186
    - Performing a Master Reset from the front panel 186
    - Parameters affected by a Master Reset 187
    - Performing a Demand Reset from the front panel 188
    - Parameters affected by a Demand Reset 188
  - Using ION Setup 189
  - Using Vista 190
  - Master Resets and Hardware-locked Meters 191

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Performing a Reset

Resets allow you to clear various accumulated parameters stored by the meter.

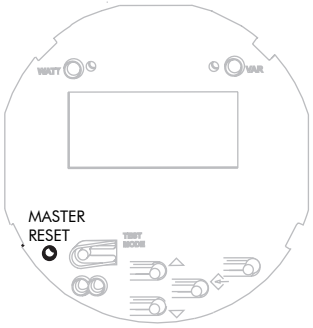
NOTE

Be sure to record any important data before performing a meter reset.

Using the Front Panel

The following resets can be performed via the front panel:

- Master Reset:
  - deletes most accumulated values and all derived revenue measurements from the meter.
- Demand Reset:
  - resets the peak demand values logged in the meter.



Performing a Master Reset from the front panel

The Master Reset button is recessed to avoid accidental activation. You must first remove the meter's cover before you can perform a Master Reset:

1. Remove the socket-sealing ring (if applicable).

DANGER

Hazardous voltages may be present on the blades. Ensure that the power supply to the socket and/or CTs are not present before removing the meter.

2. Disconnect the meter from the socket. Use both hands and pull the meter slowly towards you while gently rocking the meter up and down.

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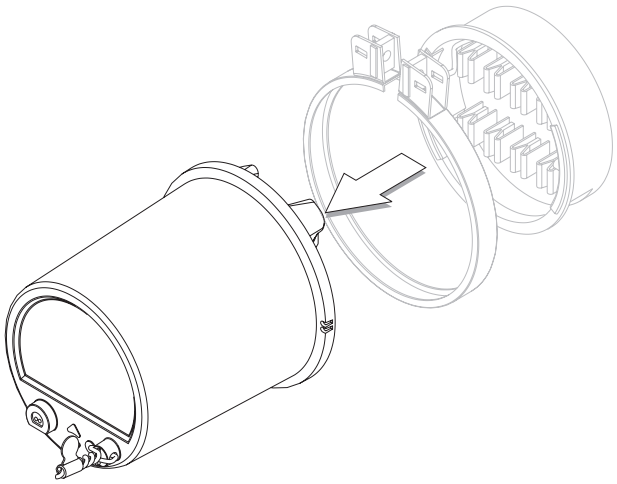
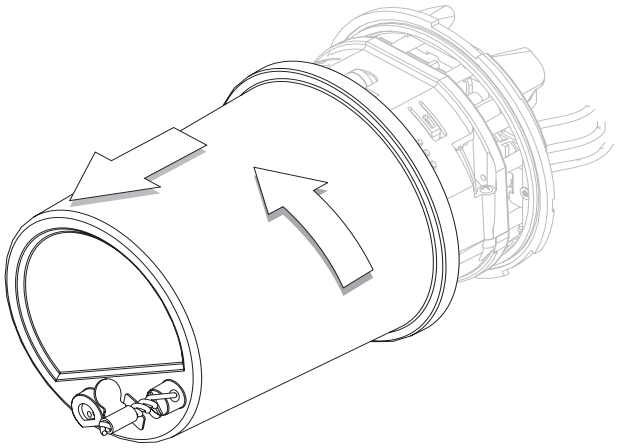


3. Remove any anti-tamper sealing device located at the base of the meter. These devices seal the meter cover to the backplate.
4. Turn the plastic cover one-quarter counterclockwise and then pull it off.



5. Using a pin or similar instrument, press and hold the Master Reset button until the "Master Reset in Progress" message is displayed on the front panel.

⚠ CAUTION

After initiating a Master Reset, wait until the "Master Reset Completed" message appears on the front panel (or about two minutes, depending on your firmware). This allows the meter to completely reset parameters. This is especially important if you are powering down the meter after a Master Reset.

Parameters affected by a Master Reset

The Master Reset button resets many of the device's measurements and logs. The mode that the meter is in (NORM mode or TEST mode - see "Modes of Operation" on page 31) defines the values that will be reset.

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NORM or ALT mode

In NORM or ALT mode, the following parameters are reset to zero:

- Energy and Demand
- Peak Demand
- Loss Calculation
- Long-term Min/Max
- Power Availability
- Power Quality disturbance counters
- Time of Use

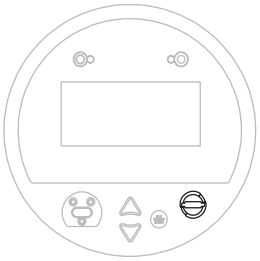
The following are cleared:

- Event Log
- All Data Recorders
- All Waveform Recorders

TEST mode

- All TEST mode Energy and Demand measurements are set to zero.

Performing a Demand Reset from the front panel



The Demand Reset switch can be activated with the cover on or off.

In most applications, the Demand Reset switch is sealed with an anti-tamper mechanism; a through-hole in the switch can accommodate either an external seal or a locking mechanism. See "Demand Reset Switch Seal" on page 71 for details of anti-tamper sealing.

Parameters affected by a Demand Reset

The mode that the meter is in (for example, NORM mode or TEST mode) defines the values that will be reset.

TEST mode

- resets the test demand parameters to zero.

Demand Lockout Time

The setup register labeled *Demand Lockout Time* (Display Options module) sets the minimum time allowed between consecutive demand resets; the meter ignores any attempts to reset the demand outside the bounds of the register.

The default value for the Demand Lockout time is 25 days. For details on the Demand Lockout Time setup register, refer to "Demand Lockout Timeout" on page 15.

For more details on the Display Options module, see the *ION Reference*.

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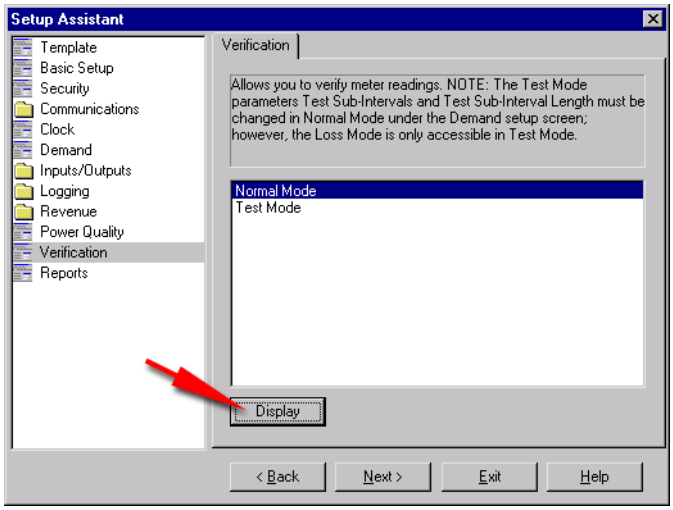
Using ION Setup

1. Open ION Setup and connect to your meter, using Basic Mode.
2. In the Setup Assistant, navigate to the Verification folder.
3. Select Normal Mode and click Display.



4. Click on various tabs in the Normal Mode dialog box. Three resets are available: Peak Reset, Master Reset and Number of Nines Reset. Click the appropriate button to perform the reset (Peak Demand in the example below).

NOTE

Master reset is not accessible via software in a hardware-locked ION8600 meter, whether the meter is in TEST, ALT or NORM mode. A master reset on a hardware-locked meter can only be performed from the front panel. See “Master Resets and Hardware-locked Meters” on page 191 for screen details. With a meter that is not hardware-locked, you can perform a Master Reset via software. It does not have to be in TEST mode.

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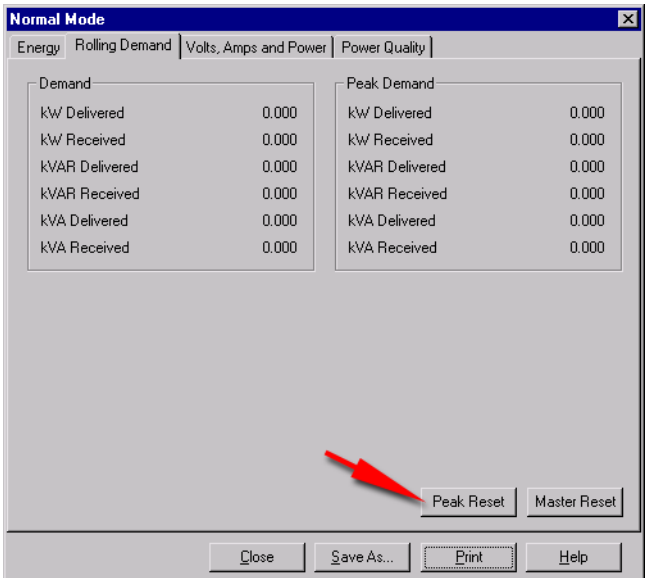

A dialog box informs you when the reset is complete.

Using Vista

Open your meter in Vista. You can perform several resets from within Vista:

Performing a Peak Demand Reset or Master Reset

NOTE

Master reset is not accessible via software in a hardware-locked ION8600 meter, whether the meter is in TEST, ALT or NORM mode. A master reset on a hardware-locked meter can only be performed from the front panel. With a meter that is not hardware-locked, you can perform a Master Reset via software. It does not have to be in TEST mode.

1. Click the System & Logs tab and click the Setup & Controls object.
2. Click the appropriate reset button to perform the reset.

Performing a Min/Max Reset

1. Click the Volts & Amps tab and click the Long-term Min/Max Measurements object.
2. Click the Min/Max reset button to perform the reset.

Performing a Sag/Swell, Availability or Harmonics Min/Max Reset

1. Click the Power Quality tab and click the Power Quality Controls object.
2. Click the appropriate reset button to perform the reset.

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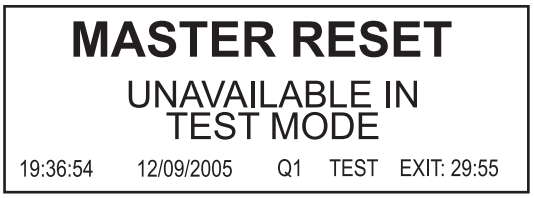
Master Resets and Hardware-locked Meters

Master reset is not accessible via software in a hardware-locked ION8600 meter, whether the meter is in TEST, ALT or NORM mode. A master reset on a hardware-locked meter can only be performed from the front panel.

Test Mode

In Test mode, the following screen is displayed:



Normal Mode, Locked

In this case the meter attempts the Master Reset, but revenue and event logs are not cleared. The rest of the Master Reset is successful.

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Chapter
18

Alerting

ION alerts can send an email or contact a modem, fax, pager, or software in the event of a user-specified condition. These conditions can be changes in relays or power quality problems including surges, sags, swells and outages.

This chapter explains how to configure your meter network for alerting.

In this chapter

- **Alerting 194**
  - Alerting ION Software via the Alarm Server 194
    - Remote Site Event Notification 195
  - Alerting via an Alphanumeric Pager 195
  - Alerting via a Numeric Pager 196
  - Alerting via Email 197

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Alerting

The meter's Alert module sends an alert whenever its *Trigger* input is pulsed. You can connect this input to any module that produces a pulse output. You can use modules that monitor alarm conditions such as changes in relay status and power quality problems. For example, you can connect the *Trigger* input to the output of a Setpoint module, thereby allowing the Alert module to send an alert when the setpoint condition is reached.

The Alert module delivers these types of alerts:

- Numeric Pager
- Alphanumeric Pager
- PEGASYS (for alerts to PEGASYS software)
- ION Alert (for alerts to ION Enterprise software)
- ASCII
- Email

Selection between modes is made with the Alert module *Alert Type* setup register.

The Alert module requires access to either a modem (a dedicated modem or a modem handling a loop of meters) or Ethernet (for the Alert module email capabilities).

Your meter has no pre-configured Alert framework. For detailed information about alerting, including how to build a framework to send alerts, refer to the Alert module description in the *ION Reference*.

Alerting ION Software via the Alarm Server

NOTE

For detailed information about sending alerts to ION Enterprise software via the Alarm Server, refer to the ION Enterprise online help.

The Alarm Server can run on any ION software Primary or Secondary server. The server computer should have a dedicated phone line and modem. Modems at remote sites are programmed to dial the server's phone number when a priority event occurs. The Alarm Server monitors the phone line and waits for the remote sites to annunciate events. The most common use of the Alarm Server is to handle Remote Site Event Notification.

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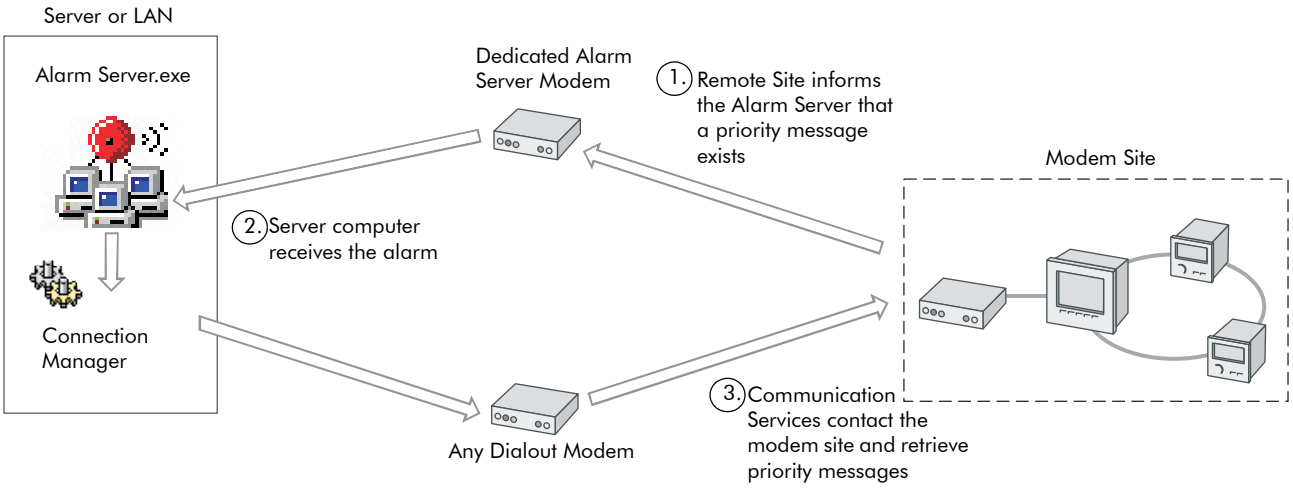
Remote Site Event Notification


Server or LAN
Alarm Server.exe
Connection Manager
Dedicated Alarm Server Modem
1. Remote Site informs the Alarm Server that a priority message exists
Modem Site
2. Server computer receives the alarm
3. Communication Services contact the modem site and retrieve priority messages
Any Dialout Modem

The Alarm Server uses a series of command line arguments to specify the actions it takes when a priority event is reported. These commands must be entered on the computer that is running the Alarm Server utility. Typically the Alarm Server is configured to launch the Connection Manager, which dials up the remote site and retrieves the logs from the devices. The Alarm Server can also be configured to launch other applications. A series of parameter switches are added to the command line to pass information about the event to the application that is launched.

Configuring the Alarm Server

The Alarm Server should have a dedicated phone line, modem, and COM port to avoid conflicts with other ION software components.

The modem used by the Alarm Server is **not** configured with the Management Console; only dialout modems are configured in the Management Console. The Alarm Server's executable, alarmsrv.exe, is typically located in ...\ION Enterprise\SYSTEM\bin. You can run the Alarm Server in a console window, or you can define a shortcut icon that includes all of the command line arguments required.

Alarm Server Command Line Arguments

Refer to the *ION Meter Alerts* technical note for a list of command lines that the Alarm Server supports.

Alerting via an Alphanumeric Pager

NOTE

For detailed information about building a framework for alerting via an alphanumeric pager, refer to the Alert module description in the online *ION Reference.*

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If an alphanumeric pager is specified as the destination address in the Alert module, then an alphanumeric paging service receives a message from the ION meter.

Once the modem at the paging service is contacted, the ION meter transmits the following information:

- Pager identification number
- Local time (year, month, date, hours, minutes, seconds)
- Remote site identification
- Priority of the alarm
- Alert message, with text strings and realtime measured values

To include a module's *Source* input in the message, reference the message string by using the form %Vn, where n is the *Source* input number. In the following *Message* register setting, the kWtot value is %V1. The string includes *Source* input 1 which would be the kWtot register from the Power Meter module.

The destination register contains your modem access number for the paging service provider and is what is dialed out first. The *Pager Num* register is the pager access number that is provided by your paging company.

Alerting via a Numeric Pager

NOTE

For detailed information about building a framework for alerting via a numeric pager, refer to the Alert module description in the online *ION Reference.*

If a numeric pager is specified as the destination address in the Alert module, then a numeric paging service receives a message from the ION meter. Due to the inherent limitations in numeric paging, the ION meter can only send a string of digits to the paging service. The Alert module then waits a specified time, determined by the number of commas inserted after the phone number in the *Pager Num* setup register. Finally, the Alert module dials the message digital string.

There are two important factors to consider when setting up the Alert module for numeric paging. First, be sure to specify a string of digits that is meaningful to you, such as a coded message. Second, be aware that there is no way to ensure that a message has been successfully transmitted; there may be a busy signal or an answering machine may take the call. The number of commas you add to your dial string is an estimate of how long the modem at the remote site waits before it transmits numbers.

NOTE

In the following destination-setting example: 1-250-555-777,,,,,999#, the pager number is 1-250-555-777 and the message string that displays on the pager is 999. You may need to insert 9,,, before the destination number if the line you are using is not a direct line. In this case the destination number is 9,,1-250-555-666,,999#

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Alerting via Email

NOTE

For detailed information about setting up your network and building a framework for meter email (MeterM@il) alerts, refer to the technical note *ION MeterM@il.*

If email is specified as the destination address in the Alert module then an email message is sent to any address you specify. You can only set one email address per Alert module. If you want to send an alert to more than one email address you need to create a group — be sure your email server is configured to send email to groups via SMTP (Simple Message Transport Protocol).

Follow the steps below to send email alerts from your meter. Note that your meter must support emailing (with a correctly configured SMTP server):

1. Create an Alert module.
2. Configure these Alert module setup registers as indicated:
   - *Message* – type in the text of the alert to be emailed.
   - *Destination* – type in the destination email address.
   - *Type* – select Email.
   - *Com Port* – select Ethernet.
   - *Location* – type in a custom string; this is optional, and appears in the email.
   - *Email From* – type in an address that you want the email to appear from. This may be required as some SMTP servers only accept emails from valid addresses.
3. Create an ION module that will produce a pulse on its *Trigger* output when the exceptional event occurs (for example, a Setpoint module pulses its *Trigger* output when the setpoint condition is reached).
4. Link the Alert module's *Trigger* input to the *Trigger* output of the module created in step 3.

Send and save. When the *Trigger* input is pulsed, the Alert module establishes communications with the SMTP mail server, and emails the alert message.

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Chapter
19

Setpoints

This chapter provides instructions for configuring meter setpoints.

In this chapter

- **Introduction** **200**
- **Configuring Setpoints** **200**
  - Using the Front Panel 200
  - Using ION Setup 200
  - Using Vista 200
  - Relative Setpoint Module Settings 201
  - Fine Tuning Over Condition Monitoring 201

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Introduction

The Relative Setpoint module provides extensive control, secondary protection, and analysis capabilities by allowing you to initiate an action in response to a specific condition. It is particularly useful for performing actions based on differences between a value (e.g. kW on phase A) relative to a reference value (e.g. kW demand for all three phases). Use this module's outputs for demand control of equipment or any other applications requiring setpoint activity relative to a varying value. See the *ION Reference* for more information on the Relative Setpoint module.

Configuring Setpoints

Use ION software to change your meter's setpoints.

Using the Front Panel

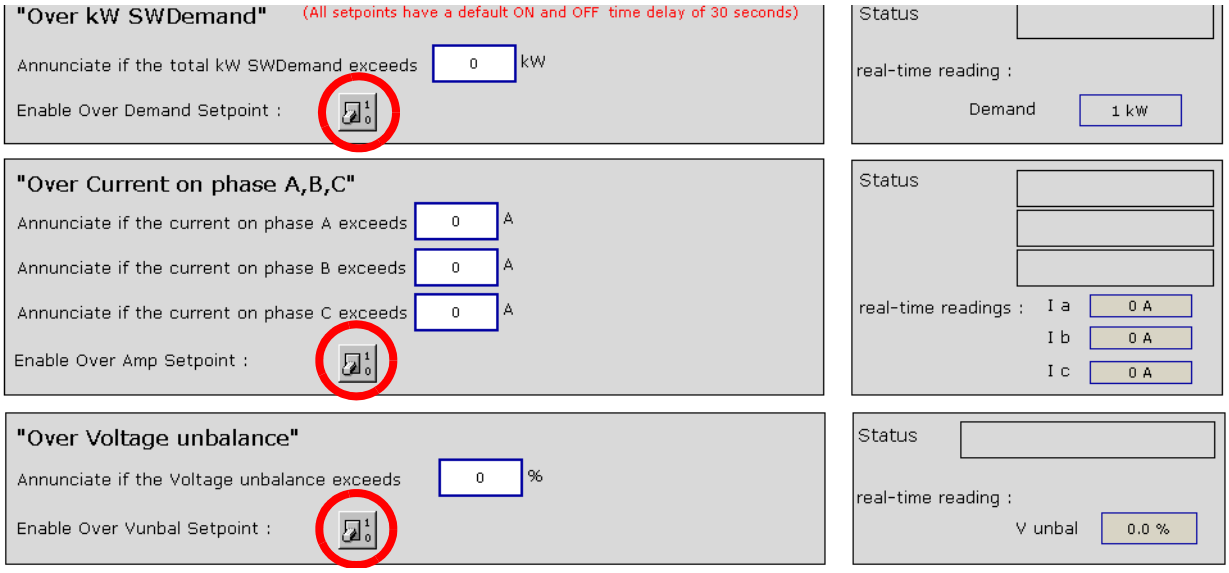
You cannot configure Setpoints using the front panel.

Using ION Setup

1. Connect to your meter in ION Setup, using Advanced Mode.
2. Click on the Relative Setpoint module you wish to configure.

Using Vista

Open your meter in Vista, and click on the Setpoints tab. Click the Setup grouping object. Use the switches to turn various monitoring on and off (see circled below). Click the numeric boxes to edit condition settings.



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Relative Setpoint Module Settings

The Relative Setpoint modules monitor the following for "over" conditions: phase current, kW demand, and voltage unbalance.

Module	Label	Description
Relative Setpoint 1	Over KW sd	When active, this annunciates when the total kW SWDemand exceeds a specified amount.
Relative Setpoint 2	Over I a	When active, this annunciates when the current on phase A exceeds a specified amount.
Relative Setpoint 3	Over I b	When active, this annunciates when the current on phase B exceeds a specified amount.
Relative Setpoint 4	Over I c	When active, this annunciates when the current on phase C exceeds a specified amount.
Relative Setpoint 5	Over V unbal	When active, this annunciates if the voltage unbalance exceeds a specified percentage.
Relative Setpoint 6	Over I 4	When active, this annunciates when I 4 exceeds a specified amount.
Relative Setpoint 7	Over I 5	When active, this annunciates when I 5 exceeds a specified amount.

NOTE

There is usually no need to change any of the Relative Setpoint modules' setup registers for normal operation of the meter.

See the *ION Reference* for more information on the Relative Setpoint module.

Fine Tuning Over Condition Monitoring

If you want to fine-tune over condition monitoring, the only setup registers you should change are *SusUntlON* and *SusUntlOFF*.

SusUntlON determines how long the modules wait after an over condition is detected before reporting it. This gives the monitored value a short period to correct itself before the event is registered with the module so that very brief over conditions are ignored. Similarly, *SusUntlOFF* is the amount of time a normal value must be present before the module considers normal operation to be restored. Both *SusUntlON* and *SusUntlOFF* values are entered in seconds (the default value for both is 30 seconds).

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Chapter
20

Power Availability

The ION8600 meter comes pre-configured with a power availability framework that provides reliability measurements using "number of nines" calculations.

NOTE

While the Availability Framework is pre-configured, the operation of this framework requires the correct configuration of the Sag/Swell module according to your meter's power supply and operating ranges. See "Sag/Swell Module Configuration" on page 206. See also the *ION Reference* for detailed descriptions of this module.

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- **Availability on the Meter Front Panel** **205**
  - Sample Availability Framework Behaviors (ION8600A and B) 205
    - Assumptions 205
  - Sag/Swell Module Configuration 206
  - Resetting and Pausing Power Availability 206
    - Using the front panel 206
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    - Pausing Availability 208
- **Detailed Behavior** **209**
    - Terminology 210

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Introduction

Power availability predicts, based on historical data, the probability that a specific power system will be functioning in its correct state at some point in the future. The availability calculation measures the time that power was available at the meter's monitoring point. This value can be used alone or incorporated with other reliability calculations.

Typically, a utility distribution system provides an availability of approximately 99.9%. Many applications require better availability than this: up to 99.9999% or better. At this level, the number of consecutive nines becomes difficult to determine at a glance. High levels of availability are commonly referred to as "Number of Nines": 99.9% corresponds to 3 nines; 99.9999% is 6 nines.

Once the meter is installed, the availability calculations must be reset to ensure valid time counts. You can reset availability calculations using ION software. You can also pause availability calculations for meter maintenance or decommissioning purposes (refer to "Resetting and Pausing Power Availability" on page 206).

Availability Framework - Release History (ION8600)

Firmware Versions	Release Dates	Availability Features	Comments
V310	March, 05	◆ Arithmetic modules compare the last-stored time before the meter went down with the time the meter regained power. ◆ Uptime calculates using a seconds counter and the down-time is added to provide the total uptime. ◆ Disturbance time taken from the Sag/Swell module and downtime is added separately. ◆ 'Include meter downtime' allows users to ignore planned outages. ◆ Sag/Swell module in ION8600 meter record an outage when the blade-powered meter is unpowered. ◆ Diagnostics module records meter outage duration.	Availability implementation requires no user setup.*

* Requires proper configuration of the Sag/Swell module to record system disturbances.

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Availability on the Meter Front Panel

The following power availability values display on the meter's front panel, and are viewable in the Vista component of ION Enterprise or ION Setup software:

- **Number of Nines**: the number of consecutive nines that appear in the most-significant digits of the availability value (e.g. "10" on the front panel indicates 10 nines: 99.99999999).
- **Availability-ppm**: the fraction of time that the power is available, in parts per million (ppm).
- **Evaluation Time (days)**: the number of days that have elapsed since the calculation was last reset. This gives an indication of the time interval over which the availability calculation is made.
- The availability framework is found at this location within Designer: Advanced Setup\Power Quality Framework\Power Availability Framework.

Sample Availability Framework Behaviors (ION8600A and B)

Scenario 1: blade powered meter + power system outage

The Sag/Swell total disturbance time includes the outage. The meter downtime from the diagnostics module is added to the meter uptime to account for the total time of observation.

Scenario 2: blade powered meter + meter decommissioned

The Sag/Swell module logs the downtime as disturbance time. When the meter powers back up, the meter downtime from the diagnostics module is added to the meter uptime.

Scenario 3: auxiliary powered meter + power system outage

The Sag/Swell total disturbance time includes the outage. The meter never loses power, which means that there is no meter downtime and the meter uptime is equivalent to the total time of observation.

Scenario 4: auxiliary powered meter + meter decommissioned

The Sag/Swell module does not log a disturbance time. When the meter powers back up, the meter downtime from the diagnostics module is added to the meter uptime.

Assumptions

The above scenarios assume that:

1. The auxiliary powered meter assumed the power system was within specs during a meter down time if it didn't detect a disturbance prior to powering down.
2. The Sag/Swell module is configured correctly to monitor voltage disturbances.
3. The Sag limit is set above the voltage level at which the meter starts powering down.

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4. An auxiliary powered meter is used for applications that require a highly accurate measurement of power system downtime.

Sag/Swell Module Configuration

Your meter's power availability framework requires that the Sag/Swell module be configured to the limits of your meter's power supply specification.

For the most current specifications, see the *ION8600 Installation Guide*.

See the *ION Reference* for detailed information on the operation of the Sag/Swell module.

The ANSI C84.1 1989 standard recommends a Swell limit of 106% for Range B voltage levels, as well as a Sag limit of 88% for load voltages and 92% for the service entrance.

Resetting and Pausing Power Availability

The power availability framework in the ION8600B and ION8600A meters allows the user to pause or reset its operation. The framework can be paused and reset with ION software.

Using the front panel

You cannot reset availability using the meter's front panel.

Using ION Setup

With ION Setup software, you can reset availability calculations by clicking on the button labeled "# of 9s Reset" in the Verification > Normal Mode > Power Quality tab.

1. Launch ION Setup software and double-click the Setup Assistant.
2. Click on the Verification setup screen, and from that screen, double-click Normal Mode.
3. In the Normal Mode screen, click the Power Quality tab.

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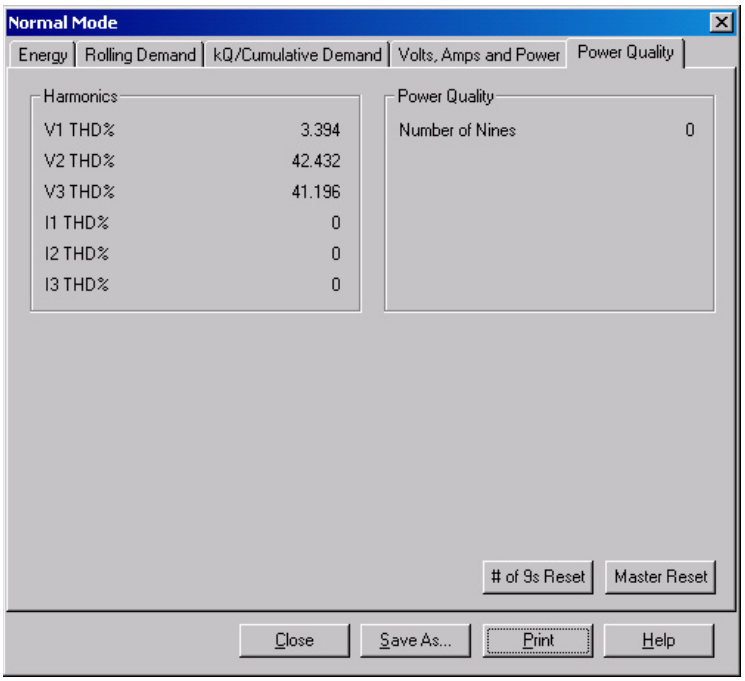
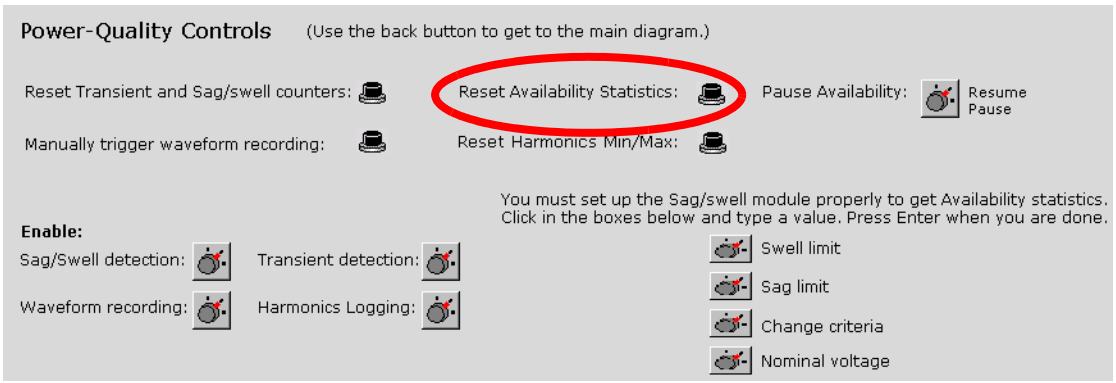
4. In the Power Quality screen, click the button labeled "# of 9s Reset" to reset availability calculations. Provide a password (if requested), and click OK.



Using Vista

With Vista software, you can manually reset availability calculations. A meter is typically reset after installation to ensure valid time counts.



Availability calculations are reset with the *Rst Avlty Stats* (Reset Availability Statistics) External Pulse module, which can be accessed through the meter's front panel or with Vista software.

To ensure correct availability calculations, do not reset during a Sag or Swell.

NOTE

The "Rst Avlty Stats" module exists in the ION8600 meter firmware v310 or later.

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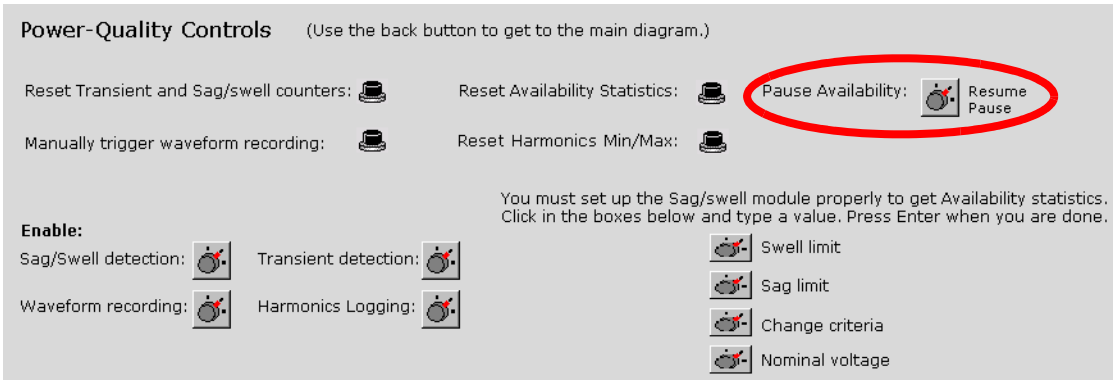
Pausing Availability

The availability framework allows a user to temporarily pause the meter uptime counter and ignore any meter downtime and disturbance time. This allows a user to decommission the meter without affecting the availability statistics. Availability statistics are also paused when the Availability framework is "turned off." Note the "Pause Availability" switch on the graphic below.



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Detailed Behavior

The Availability framework measures Disturbance time from the Sag/Swell module, Uptime from a counter module and meter Downtime from the Diagnostics module. Meter Downtime is added to the Uptime count to provide the total time of observation.

The meter uses three measurements when calculating the availability:

1. **Meter Uptime**: the time the meter is powered and actively monitoring. The time is measured by counting 1-second pulses from a periodic timer module.
2. **Meter Downtime**: this time is measured by the meter's internal clock and made available through the diagnostics module. The diagnostics module downtime register is updated on each power up. This calculation is accurate across a single month boundary: any additional month boundaries are assumed to have 30 days. You must set the Sag limit above the minimum voltage level specific to the power supply and wiring configuration of the meter (see "Sag/Swell Module Configuration" on page 206). If there is no control power then it is assumed there is no power anywhere, and this time counts against availability.

   When the meter powers up, it takes about 15 seconds before the ION modules are operational again. This power up time counts against the availability (a single power up per year limits total availability to 6 nines). If the application requires better resolution than this, then a UPS or other auxiliary power supply for the meter should be considered.

   If the meter or control power circuit is taken out of service for maintenance, you can disable the measurement of meter downtime with ION software; see "Pausing Availability" on page 208.

Number of Nines	ppm (% x 10,000)	Downtime (seconds/year)	Downtime per year
1	90%	3153600	36.5 days
2	99%	315360	3.7 days
3	99.9%	31536	8.8 hours
4	99.99%	3153.6	52.6 minutes
5	99.999%	315.36	5.3 minutes
6	99.9999%	31.536	31.5 seconds
7	99.99999%	3.153599998	3.2 seconds
8	99.999999%	.3153599998	.32 seconds
9	99.9999999%	.03153599998	.032 seconds
10	99.99999999%	.003153599998	.0032 seconds

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3. **Voltage Disturbance Duration**: the total number of seconds that the voltage was outside the envelope determined by the Sag/Swell module. If several sags or swells occur during one second, only the last one counts toward the total. The Sag/Swell module settings may be used to control the voltage tolerance. If the Sag/Swell module is not enabled, no voltage disturbances are counted.

Terminology

- **Blade-powered meter:** the power to run the meter is derived from the Voltage input terminals that are connected to the monitored system. The meter loses power if the monitored system is down.
- **Auxiliary-powered meter:** The power to run the meter is derived from an independent power source. The meter remains powered when the monitored system is down.
- **Meter uptime:** the time the meter is powered and actively monitoring. The time is measured by counting 1-second pulses from a periodic timer module.
- **Meter downtime:** the time the meter is not powered. This time is measured by the meter's internal clock and made available through the diagnostics module. The diagnostics module downtime register is reset at the beginning of each outage.
- **Availability:** the probability of finding a system in the operating state at some time into the future. Availability is calculated as:

$$\text{Availability} = \frac{\text{Time the power system is operating within specifications}}{\text{Total time of operation*}}$$

$$= \frac{\text{Meter uptime - disturbance time}}{\text{Meter uptime + meter downtime}}$$

* Where total time of observation = uptime + meter downtime

- **Unavailability:** calculated in the framework and then converted to number of nines, and Availability in percent and parts per million (ppm):

$$\text{Unavailability} = \frac{\text{Time the power system is operating outside specifications}}{\text{Total time of operation*}}$$

$$= \frac{\text{Disturbance time}}{\text{Meter uptime + meter downtime}}$$

* Where total time of observation = uptime + meter downtime

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Chapter
21

Reports

This chapter provides instructions for viewing various meter reports and logs.

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- **Viewing Meter Logs** **212**
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  - Using Vista 214

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Introduction

Accumulated meter values are saved in logs. These **logs** are acquired by your energy management software (ION Enterprise or third-party) and saved in its database for analysis and reporting.

The Reporter component of ION Enterprise is a database reporting application that lets you define, generate, and manage comprehensive **reports** based on the information in your system database. It processes selected data and generates a finished report in Microsoft Excel 2000 format.

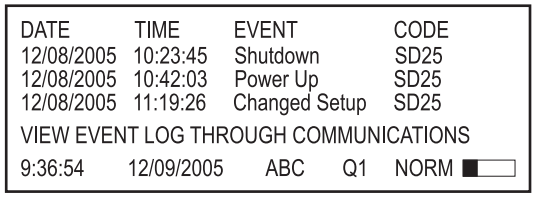
For more information on reports, see the Reporter section of the online *ION Enterprise Help*.

Viewing Meter Logs

View meter logs using ION software or the front panel.

Using the Front Panel

The front panel only displays recent high priority events (Event Log).


DATE TIME EVENT CODE
12/08/2005 10:23:45 Shutdown SD25
12/08/2005 10:42:03 Power Up SD25
12/08/2005 11:19:26 Changed Setup SD25
VIEW EVENT LOG THROUGH COMMUNICATIONS
9:36:54 12/09/2005 ABC Q1 NORM

Press the Up/Down buttons to navigate to the Event Log.

Using ION Setup

Display various meter logs or reports using the Report Assistant.

1. Open ION Setup and connect to your meter, using Basic Mode.
2. In the Setup Assistant, navigate to the Reports folder.

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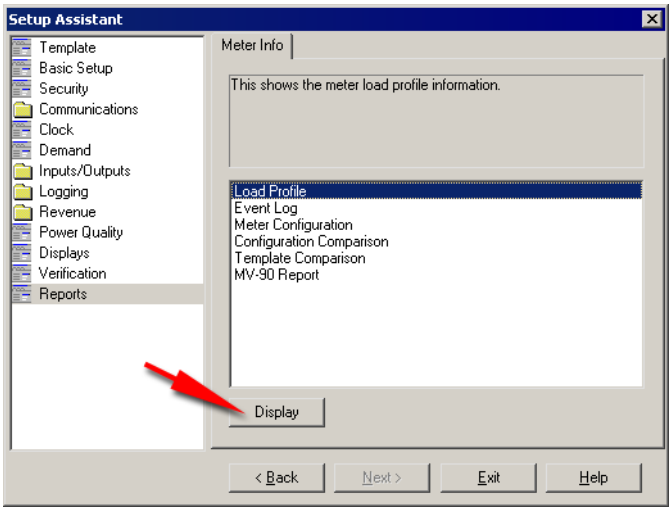
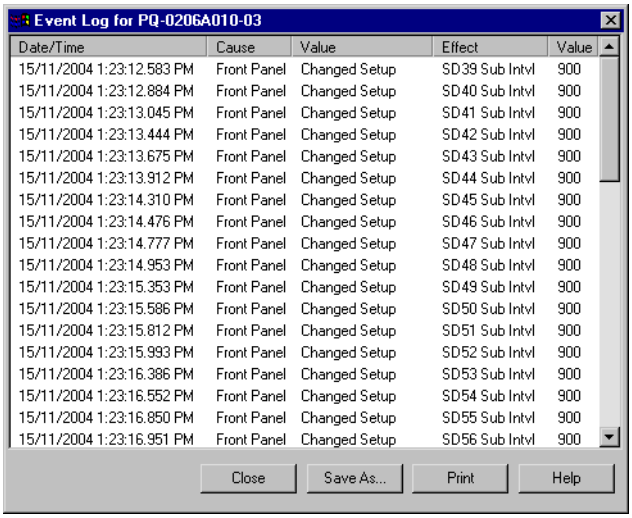


3. Select one of the logs or comparisons in the list and click **Display** to view the associated log.

   Below is an example of an Events Log.


Event Log for PQ-0206A010-03
Date/Time Cause Value Effect Value
15/11/2004 1:23:12.583 PM Front Panel Changed Setup SD39 Sub Intvl 900
15/11/2004 1:23:12.884 PM Front Panel Changed Setup SD40 Sub Intvl 900
15/11/2004 1:23:13.045 PM Front Panel Changed Setup SD41 Sub Intvl 900
15/11/2004 1:23:13.444 PM Front Panel Changed Setup SD42 Sub Intvl 900
15/11/2004 1:23:13.675 PM Front Panel Changed Setup SD43 Sub Intvl 900
15/11/2004 1:23:13.912 PM Front Panel Changed Setup SD44 Sub Intvl 900
15/11/2004 1:23:14.310 PM Front Panel Changed Setup SD45 Sub Intvl 900
15/11/2004 1:23:14.476 PM Front Panel Changed Setup SD46 Sub Intvl 900
15/11/2004 1:23:14.777 PM Front Panel Changed Setup SD47 Sub Intvl 900
15/11/2004 1:23:14.953 PM Front Panel Changed Setup SD48 Sub Intvl 900
15/11/2004 1:23:15.353 PM Front Panel Changed Setup SD49 Sub Intvl 900
15/11/2004 1:23:15.586 PM Front Panel Changed Setup SD50 Sub Intvl 900
15/11/2004 1:23:15.812 PM Front Panel Changed Setup SD51 Sub Intvl 900
15/11/2004 1:23:15.993 PM Front Panel Changed Setup SD52 Sub Intvl 900
15/11/2004 1:23:16.386 PM Front Panel Changed Setup SD53 Sub Intvl 900
15/11/2004 1:23:16.552 PM Front Panel Changed Setup SD54 Sub Intvl 900
15/11/2004 1:23:16.850 PM Front Panel Changed Setup SD55 Sub Intvl 900
15/11/2004 1:23:16.951 PM Front Panel Changed Setup SD56 Sub Intvl 900
Close
Save As...
Print
Help

4. You can view, save or print the log. Click **Close** to exit.

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Using Vista

Open your meter in Vista and click on the various tabs available. Click a grouping object to view the associated logs. The following logs are available in Vista:

- Volts/Amps tab:
  - Meter Events
  - Voltage
  - Current
  - Power
  - Frequency/PF
- Revenue tab:
  - Revenue Data
- Power Quality tab:
  - Harmonics Trending
  - Transient & Sag/Swell Statistics CBEMA
  - Waveforms/Sequence of Events

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Chapter
22

Verifying Accuracy

All ION8600 meters are tested and verified at the factory according to IEC (International Electrotechnical Commission) standards; however, before a new revenue meter is installed it is important to perform a final accuracy verification.

ION meters are digital and do not require calibration, only verification of their accuracy. This chapter outlines a procedure for accuracy testing ION8600 meters.

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  - Current Ranges 216
  - Testing Overview 216
  - Using TEST Mode 217
  - Test Procedure 218
  - Test Settings 219
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    - Test Points 221

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Introduction

The revenue-accurate ION meter is digital and therefore needs no servicing. It is tested for accuracy at the factory and remains accurate for the life of the meter. In contrast, electro-mechanical meters need mechanical adjustment before installation and periodic calibration thereafter. This procedure of 'calibration testing' is unnecessary for digital meters.

Digital meters require 'accuracy' testing, or verification to ensure the meter meets required accuracy specification. If you know your meter is within required accuracy specification before installation, errors observed in the field could be attributed to incorrect connections or instrument transformer ratio settings.

Accuracy Standards

The meter conforms to the following accuracy standards:

- IEC 60687 1A 0.2S
- IEC 60687 5A 0.2S
- ANSI C12.20 Class 20 0.2
- ANSI Cl12.20 Class 2/10 0.2.
- Accuracy measurements in the range of 10 mA to 20 A.

Current Ranges

The meter meets the following current ranges:

- Compatible with CTs in the range of 10 mA to 20 A
- Over-range current of 24 A
- Starting current of 1 mA.

⚠ DANGER

During normal operation of the meter, hazardous voltages are present which can cause severe injury or death. These voltages are present on the terminal strips of the device and throughout the connected potential transformer (PT), current transformer (CT), status input, relay, and control power circuits. Only qualified, properly trained personnel should perform installation and servicing.

Testing Overview

The most common method for testing meters is to inject voltage and current from a stable power source in combination with a reference meter. Although meter shops use different methods for testing revenue meters, most test equipment requirements are similar. The sections below provide an overview and some test equipment guidelines for verifying the accuracy of your ION8600.

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Test socket

A test socket is a convenient mounting device that fits socket-type meters. Ensure that the test socket for the meter or the mounting device is wired properly. The current and voltage transformers must be accurately rated and must perform within specifications to provide accurate results.

Power source

It is important to have a steady power source. Power that energizes the meter from the socket must be reliable and provide: the rated voltage of the meter, unity power factor (1) and lagging power factor of 0.0 (for VARh testing) or 0.5.

Test loads

There are three methods of current loading: customer's load (a meter in service), resistance load (characteristics similar to a lighting load), phantom loading (a test board). Your test load device or other loading circuit must be set within the current capacity ranges for the meter. The procedure outlined in this technical note describes verification using a phantom load or test board.

Control equipment

Control equipment is required for counting and timing the pulse outputs (revolutions) from the front panel LEDs. Most standard test benches have an arm with infrared sensors used for this purpose.

Environment

The meter should be tested at the same temperature as the testing equipment. The ideal temperature is about 22°C (72°F). Ensure the meter is warmed-up sufficiently before testing.

NOTE

Ensure the accuracy and precision of any measurement equipment you use (i.e. voltmeters, ammeters, power factor meters).

Using TEST Mode

When the meter is in TEST mode it does not accumulate billable quantities. The test measurements collected by the meter are sent to different registers so that the billing quantities are not changed.

NOTE

If you have a hardware-locked meter you must remove the cover and manually press the TEST mode button. If your meter is not hardware-locked you can use ION Setup software to place the meter in TEST mode.

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When you exit TEST mode all test measurements are reset to zero. The values shown on the TEST mode display screens include:

Values	Description
kWh del T, kWh rec T	Test values of kWh delivered and kWh received
kVAR del T, kVARh rec T	Test values of kVARh delivered and kVARh received
kVAh del T, kVAh rec T	Test values of kVAh delivered and kVAh received
kW SD del T, kW SD rec T	Instantaneous Rolling Block (Sliding Window) Demand delivered and received

Test Procedure

The following are guidelines for testing the meter. Your meter shop may have specific testing methods:

1. Place the meter into the test socket or other standard measuring device. If you are not using a plug-in socket, ensure all voltages are in parallel with the meter being tested and all currents are in series.
2. Connect the control equipment used for switching the voltage to the test standard device.
3. Connect the control equipment used for counting the standard output pulses.
4. Apply the rated current and voltage to the terminals of the meter.
5. Before performing the verification test, let the test equipment power up the meter; apply voltage for at least 20 seconds. The warm-up allows the internal circuity and capacitors to stabilize.
6. You may choose to place the meter in TEST mode. This allows the meter to enter the field with no Wh values in the registers. If you are performing field testing, put the meter in TEST mode to avoid incorrect customer billing.
7. Align the infrared sensor on the standard test bench armature over the appropriate front panel LED pulser.

TIP

If the outer cover is still on the meter, align the meter sensor slightly off-perpendicular to the LEDs. This reduces reflections from the outer cover.

8. Perform testing on the test points (“Watt-hour test points” and “VAR-hour points” on page 221).
9. Run each test point for at least five seconds to allow the test bench equipment to read an adequate number of pulses. Allow three seconds of dwell time between test points.

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Test Settings

When testing the meter, ensure the test parameters are suited to your testing methods. You may need to adjust the front panel LED pulse rate and the test mode timeout.

NOTE

If the maximum pulse rate is exceeded the WATT LED remains on (does not blink).

LED pulser settings

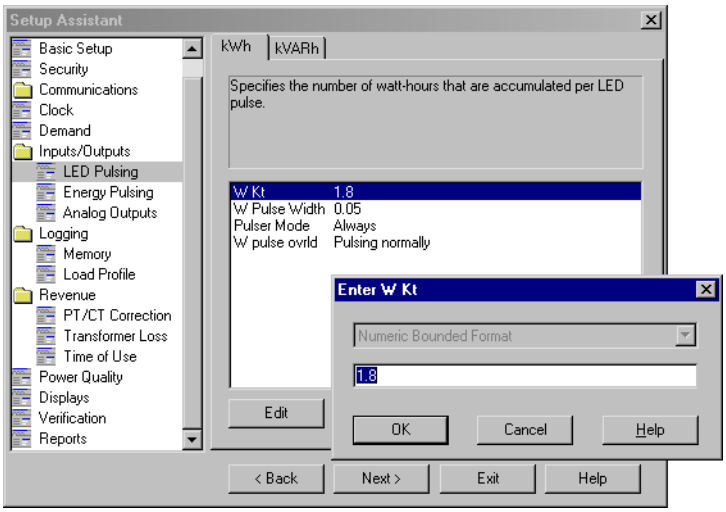
The two LEDs on the front panel are preconfigured for energy pulsing. The adjacent smaller infrared outputs are connected to the LEDs and pulse at the same rate. You may need to increase the Kt value if the LED does not pulse.

Changing the LED pulse rate from the Front Panel

You cannot change the LED pulse rate from the meter's front panel.

Changing the LED pulse rate in ION Setup

1. Open the Setup Assistant in ION Setup.
2. Select the LED Pulsing screen.



3. Edit the kWh and kVARh values as desired.

Changing the LED pulse rate in Designer

1. Open the meter using Designer software and double-click the Pulse Frequency folder in Energy Pulsing Setup.
2. Right-click the Calibration Pulser module you want to modify.
3. Double-click the register you want, make your change and click OK.
4. Click the Save icon (or choose Send & Save from the File menu).

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The value entered defines how much energy the module accumulates before a pulse is sent to the hardware channel. The front panel WATT and VAR LEDs are factory set to the same pulse rate. The default Kt value is shown on the front panel label of the ION8600 meter and depends on the Form Factor that the meter services.

The pulse rates are summarized below:

Form Factor	Default pulse rate for WATT LED	Default pulse rate for VAR LED (Kt)
9S, 39S, 36S, 76S meters	1.8 Watts per pulse	1.8 VARs per pulse
35S meters	1.2 Watts per pulse	1.2 VARs per pulse

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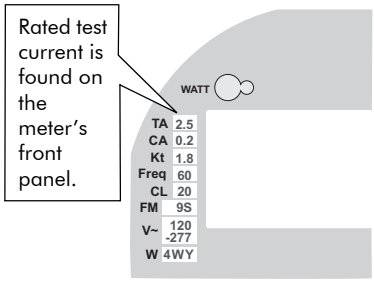
Test Points

NOTE

It is recommended that you test the ION8600 meter at Full and Light Loads.



Watt-hour test points

It is common practice to test these Watt-hour test points:

Watt-hour Test Point	Specifications
Full Load	100% of the rated current, test voltage and rated frequency at unity power factor, or one (1).[1]
Light Load	10% of the rated current, test voltage and rated frequency at unity power factor, or one (1).
Lagging Power Factor	100% of the rated current, test voltage and rated frequency at 0.50 lagging power factor (current lagging voltage by 60° phase angle).

[1] The rated test current is found on the ION8600 meter front panel label.

VAR-hour points

It is common practice to test these VAR-hour test points:

VAR-hour Test Point	Specifications
Full Load	100% of the rated current, test voltage and rated frequency at unity power factor, or one (1).[1]
Light Load	10% of the rated current, test voltage and rated frequency at unity power factor, or one (1).

[1] The rated test current is found on the ION8600 meter front panel label.

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PowerLogic ION8600
User Guide

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Getting technical support:
Contact your local Schneider Electric sales representative for assistance or go to the www.powerlogic.com website.

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